Perspectives on Knowledge Utilization in Education

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In this paper I explain why knowledge utilization (KU) has become so important, why so many perspectives on KU exist, and then briefly describe key summaries of KU literature.

A Revolutionary Worldview: The Knowledge Society

The field of research on knowledge utilization is immense and growing rapidly. The primary reason for the great interest in KU is simply that developed nations around the world are now in what Peter Drucker calls The Knowledge Age. Many people have written about the Information Age or Knowledge Age, but I find that Drucker is particularly cogent. So I start with some lengthy extracts from an article available on the web.[1] Drucker begins his essay by observing that no century in recorded history has experienced as many radical social transformations as the twentieth century. After tracing the shift from agricultural workers, to industrial workers, Drucker says:

> The newly emerging dominant group is "knowledge workers." . . . By the end of this century knowledge workers will make up a third or more of the work force in the United States—as large a proportion as manufacturing workers ever made up, except in wartime.
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> . . .
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> Knowledge work varies tremendously in the amount and kind of formal knowledge required. Some jobs have fairly low requirements, and others require the kind of knowledge the neurosurgeon possesses. But even if the knowledge itself is quite primitive, only formal education can provide it.
>
> **Education will become the center of the knowledge society, and the school its key institution**. What knowledge must everybody have? What is "quality" in learning and teaching? These will of necessity become central concerns of the knowledge society, and central political issues. **In fact, the acquisition and distribution of formal knowledge may come to occupy the place in the politics of the knowledge society which the acquisition and distribution of property and income have occupied in our politics over the two or three centuries that we have come to call the Age of Capitalism.** [Emphasis added throughout by bolding.]

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[1] Peter Drucker, "The Age of Social Transformation," *The Atlantic Monthly*, November 1994. Available on the Internet at: http://www.theatlantic.com/politics/ecbig/soctrans.htm
"A survey of the epoch that began early in this century, and an analysis of its latest manifestations: an economic order in which knowledge, not labor or raw material or capital, is the key resource; a social order in which inequality based on knowledge is a major challenge; and a polity in which government cannot be looked to for solving social and economic problems"

> In the knowledge society, clearly, more and more knowledge, and especially advanced knowledge, will be acquired well past the age of formal schooling and increasingly, perhaps, through educational processes that do not center on the traditional school. **But at the same time, the performance of the schools and the basic values of the schools will be of increasing concern to society as a whole, rather than being considered professional matters that can safely be left to "educators."**

Stated tersely, knowledge—its production, transfer, and use—have become profoundly important, but also troubling in terms of who masters knowledge work and who does not. Drucker notes that a society in which knowledge workers dominate is under threat from a new class conflict between the knowledge workers and the majority of people who will make their living traditionally, either by manual work or by work in services. He then asserts:

> The productivity of knowledge work—still abysmally low—will become the economic challenge of the knowledge society. On it will depend the competitive position of every single country, every single industry, every single institution within society. The productivity of the non-knowledge, services worker will become the social challenge of the knowledge society. On it will depend the ability of the knowledge society to give decent incomes, and with them dignity and status, to non-knowledge workers.
>
> No society in history has faced these challenges. But equally new are the opportunities of the knowledge society. In the knowledge society, for the first time in history, the possibility of leadership will be open to all. Also, the possibility of acquiring knowledge will no longer depend on obtaining a prescribed education at a given age. Learning will become the tool of the individual—available to him or her at any age—if only because so much skill and knowledge can be acquired by means of the new learning technologies.
>
> Another implication is that how well an individual, an organization, an industry, a country, does in acquiring and applying knowledge will become the key competitive factor . . . There will be no "poor" countries. There will only be ignorant countries. And the same will be true for companies, industries, and organizations of all kinds. It will be true for individuals, too. In fact, developed societies have already become infinitely more competitive for individuals than were the societies of the beginning of this century, let alone earlier ones.

I have quoted Drucker at length because he provides a cogent "world view" that helps to appreciate how profoundly central and strategic knowledge, education, and schooling have become in a Knowledge Society. Consequently, the need for vastly more attention to be given to improving "knowledge utilization" should be obvious. However, I find it strange that so relatively few in the U.S. educational R&D community seem to really comprehend what is happening. The reason, I believe, is that old linear R&D paradigms, assumptions, models, and associated language trap many education R&D policy makers and performers.

Knowledge Use Paradigm Shift

Thomas Kuhn (*The Structure of Scientific Revolutions*, 1996) has helped many to understand the process of paradigm shifts in various scientific disciplines. I argue in this section that, within the

worldview of the Knowledge Society, constructivism, complexity, and new views of knowledge that stress its implicit and social nature are major "drivers" for the creation of new knowledge use paradigms. But let's go back more than two decades. With respect to knowledge use in the field of education, here is the view of some leaders who attended the 1977 National Dissemination Forum.[2]

Group 1.2 Knowledge Utilization Models

1. Much of the discussion at the Forum seems to imply the following model:

    RESEARCH ----> DISSEMINATION ----> USE/APPLICATION

    Or perhaps this model if two-way "exchange" is considered:

    RESEARCH <----> DISSEMINATION <----> USE/APPLICATION

Dissemination has become the "gap-filler" between research and use/application. The concept of Development seems to have disappeared from our vocabulary. Dissemination has become the generic term for all knowledge transfer or communication activities. Some of the members of this group questioned the adequacy of such an encompassing concept of dissemination. It may be a convenient short-hand, but we need knowledge use (KU) models that will discriminate among vastly different models of research-based knowledge use as well as an understanding of how these models differ from other KU models that are not particularly research-based in terms of the source of knowledge.

2. This leads to a set of simple questions about models of knowledge use:
    - What is the character of the Knowledge that is used?
    - Who is the User? What do we Know/Assume about the user?
    - What is the Purpose of use? What outcomes are intended?
    - What would it be important to know about the use Situation/Context?
    - What do the answers to these questions imply for improving knowledge transfer, communication and knowledge utilization?

3. If we are challenged to create a better research and dissemination "system," what is the super-ordinate goal of the system? What is the shared vision around which collaboration should be organized?

4. At the most fundamental level, there seems to be a tension between two vastly different, almost diametrically opposed, conceptions of knowledge acquisition. One extreme seems to be a conception of filling an "empty vessel" with facts or information. Information is "objective," easily communicated, and easily apprehended. Facts speak for themselves. Products and programs can be adopted and implemented. At the other extreme we find images of engaging or supporting "communities of learners," of individual learning as a complex reconstruction of cognitive frames and meanings/values, or of organizations that must "restructure" and become "learning organizations." Somewhere between these two extremes seems to be much of our current "in-practice" models of KU.

[2] Paul Hood moderated the forum KU models group, reported the group's deliberation at the plenary session, and wrote up the notes that are copied in this section.

5. A related tension is between attending to/defining, simple, universal "needs" of knowledge users versus attending to the "voice of the customer" through a protracted "conversation" that results in continuous feedback that effectively couples with the knowledge production process. Market research can inform either conception of "needs assessment," but the process will be markedly different. At one extreme, we assume we know what the user wants or needs, at the other we maintain a dialogue that intimately affects both the knowledge producer and the knowledge consumer.

6. This line of discussion provoked the distinction between two paradigms:

a) The Dissemination Paradigm, in which some form of knowledge, produced someplace, is broadly disseminated to many users, often at some distance, physically and sometimes culturally, from the point of knowledge production. Thus the knowledge is "external" to the user system. From the knowledge producer's standpoint, the challenge is to communicate with and achieve producer-intended forms of use of this knowledge among many potential users. Dissemination, marketing, mass media, on-line information systems, and telephone 800 numbers for information services become some of the vehicles for communication between producer and user.

b) The Systemic Change Process Paradigm, in which the main focus of knowledge use and production is in one location—whether that is a person's head or a large organization. The knowledge use process is local, complex and dynamic. And most of the knowledge production is "local." Externally produced knowledge (ideas, products, programs, technologies) may be stimulative or facilitative, but this use of external knowledge is often incidental or subordinate to achieving synergistic changes in group or organizational structures, policies, operating procedures, and perhaps even the working environment of the organization and in the attitudes, skills, motives, values, and shared visions of those involved in this form of systemic change process. "Research-based" knowledge may be represented more by processes of local disciplined inquiry and reflection than by the products of externally produced research. But this is rarely an either-or situation, rather it is a melding of knowledge in many forms from many sources.

Many of our current conceptions of KU involve some mixture of these two paradigms. Thus, we have extension agents and linking agents, technical assistance providers, trainers, consultants, and other forms of "external assistance" that may support the local systemic change process. Yet, the closer we get to the core of a complex systemic change process and the more we stay with it, the more we realize that "dissemination" is an alien, almost irrelevant, concept for comprehending or dealing with what seems to be at stake. As we take seriously the challenges to employ research to support systemic reforms in American education, we may see more of a shift from the Dissemination Paradigm to the Systemic Change Process Paradigm.

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Let us move forward to the present time, but consider again what our answers might be to:

- What is the character of the Knowledge that is used?
- Who is the User? What do we Know/Assume about the user?
- What is the Purpose of use? What outcomes are intended?
- What would it be important to know about the use Situation/Context?
- What do the answers to the above questions imply for improving knowledge transfer/communication and knowledge utilization?

> If we are challenged to create a better research and dissemination "system," what is the super-ordinate goal of the system? What is the shared vision around which collaboration should be organized?

It seems obvious that, today, we should give markedly different answers to all these questions than we might have given 25 years ago. With respect to the last question, our super-ordinate goal should be understood within the context of the Knowledge Society and the imperative that we must transform all of our educational systems (at every level and everywhere) to provide far more effective life-long learning opportunities for every citizen in our nation (and indeed for people around the world).

It would be monumental hubris to believe that education R&D could by itself accomplish such a transformation — that will be, as Drucker says, a concern for our entire society. However, education R&D could be a powerful catalyst. Yet that is likely to happen only if there are equally profound transformations in the practice of education R&D. Clearly, one place to start would be to focus on the production, transfer, and promotion of use of "reliable" knowledge[3] by all those concerned with improving education in a Knowledge Society. "Knowledge utilization" seems an apt term to define this area of challenge to the education R&D community.

Constructivism, Complexity, Tacit Knowledge & Situated Knowledge

Over the past half-century there has been a significant change in what information scientists have been concerned with. We have seen a massive expansion in the scope of information science from concerns focused primarily on physical science content to concerns with content that includes the physical, social and behavioral sciences along with content in a multitude of applied fields. We have moved from preoccupation with archives and collections to concerns with dissemination, marketing and distribution, and then to concerns with implementation, utilization and impact. We have moved from preoccupations with tangible, formal formats and channels to inclusion of less tangible, informal formats and channels. And especially during the last decade, we have contended with the implications of digitalization, hyper-media, the Internet and computer-augmented learning and information processing. Finally, as we have dealt with needs of users in fields beyond the scientific disciplines (e.g., business, industry, health, education, public policy) we have discovered that scientific and technical information alone is rarely sufficient to meet users' needs. Craft knowledge usually must be melded with scientific knowledge. All these changes have had a profound effect on our conceptions of the design and operation of effective information systems, and more fundamentally on our conceptions of knowledge and the processes of knowledge utilization.

We have noted that in the Knowledge Society, constructivism, complexity, and new views of knowledge that stress its implicit and social nature are major "drivers" for the creation of

[3] I've deliberately used the term reliable knowledge in preference to research-based knowledge in order to recognize that most forms of complex knowledge actually used by most practititioners most of the time are more likely to be some melding of craft knowledge with research-based knowledge.

new knowledge use paradigms. To make this assertion clearer let us explore what may be some useful dimensions for conceptualizing or "mapping" the current domain of thinking about knowledge utilization. Here we focus on perspectives on knowledge. Four dimensions are particularly useful to consider. Labeling these dimensions by their extremes, they are:

- Objective—Constructed
- Simple—Complex
- Explicit—Tacit
- Individual—Social

Objective—Constructed.

First we consider the shift in thinking about knowledge as an objective, stable commodity to thinking about knowledge as dynamic and constructed. By the late 1970s the contrast was evident to those attending the 1977 National Dissemination Forum. We repeat that part of the notes from the knowledge utilization models group:

> At the most fundamental level, there seems to be a tension between two vastly different, almost diametrically opposed, conceptions of knowledge acquisition. One extreme seems to be a conception of filling an "empty vessel" with facts or information. Information is "objective," easily communicated, and easily apprehended. Facts speak for themselves. Products and programs can be adopted and implemented. At the other extreme we find images of engaging or supporting "communities of learners," of individual learning as a complex reconstruction of cognitive frames and meanings/values, or of organizations that must "restructure" and become "learning organizations." Somewhere between these two extremes seems to be much of our current "in-practice" models of KU.

At mid-century, American psychology, under the influence of a prevailing behaviorism, accepted the assumptions of an objectivist epistemology. In this view, knowledge is seen as the accumulation of discrete pieces of evidence. George Kelly (1955, 1963) termed it accumulative fragmentalism. Emphasis is placed on logical thinking rather than understanding. However, by the mid-1960s, social science moved away from the behaviorist value neutrality and detachment back to an earlier problem-oriented tradition to confront a problem-fraught national agenda (poverty, race riots, and the Vietnam War). A broad range of research approaches developed, including greater emphasis on qualitative policy research as well as case study of implementation research. In this environment, cognitive strands, tracing back to Dewey, Piaget, and Vygotsky, gained new prominence. In education, findings in cognitive psychology and a new interest in constructivism supported this emphasis. Constructivism offers a different view that focuses attention on the processes of interpretation that lead to understanding**.** According to constructivist theory, knowledge is developmental, internally constructed, and socially and culturally mediated. Learners actively construct their knowledge in their attempts to make sense of their world. This philosophy also shifts attention from teaching to focus more directly on learning and. student knowledge formation. A particular version of constructivism places an emphasis on situated learning and on communities of practice.

In the field of the psychology of learning, Lev Vygotsky has exercised great influence through his model of social constructivism (Kozulin, 1990; Wertsch. 1985). Vygotsky

emphasizes the influences of cultural and social contexts in learning and supports an active discovery model of learning. Vygotsky distinguishes three levels of knowledge: "manifest content" (facts, data), "instrumental knowledge" (methods, skills, procedures), and "structural knowledge" (knowledge structures and underlying modes of thinking). He asserts that learning and human development is a social and collaborative activity that cannot be taught to anyone. The learner must construct his or her own understanding. However, the teacher or others can act as facilitator. According to Vygotsky's concept of the zone of proximal development, problem solving skills can be placed in three categories: those performed independently, those that cannot be performed even with help, and those that fall between these extremes, the tasks that can be performed with help from others. It is in this last category, the zone of proximal development, that optimal learning should be supported. This learning should take place within meaningful contexts that are close to the contexts in which knowledge is to be applied. Although when we consider these ideas we may typically think of a child in a school room setting, they apply to all forms of human learning including that of educational researchers, policymakers or educational practitioners.

A particular version of constructivism places an emphasis on situated learning and on communities of practice. Situated learning is a general theory of knowledge acquisition. Lave (1988) argues that learning is situated, that is, as it normally occurs learning is a function of the activity, context, and culture in which it occurs. Social interaction is a critical component of situated learning. Learners become involved in a "community of practice" which shares specific beliefs and behaviors. As newcomers move from the periphery of the community to its center, they become active and engaged within the micro-culture of the community. This process is what Lave and Wenger (1991) call "legitimate peripheral participation." Brown, Collins & Duguid (1989), building on this theory of situated learning, emphasize the idea of cognitive apprenticeship. They state that: "Cognitive apprenticeship supports learning in a domain by enabling students to acquire, develop and use cognitive tools in authentic domain activity. Thus, learning outside and inside schools advances through collaborative social interaction and social construction of knowledge.

Simple—Complex.

People tend to treat information as self-contained and objective. It is something that you can write down or capture in some other form, accumulate, possess, store on a shelf or put in a database, compile, quantify, lose, find, retrieve, process, or distribute. As we progress along this continuum, we encounter more complex conceptions of information that begin to shade into conceptions of knowledge. In contrast to information, knowledge is associated with a "knower." Knowledge is hard to access or transfer to another. Knowledge is something that we digest or assimilate. It involves the knower's understanding. Thus, as we shift to conceptions of more complex knowledge we must place more emphasis on people and less emphasis on tangible objects or inanimate information systems. One of the main characteristics of complex knowledge is that to master it requires mastery of several different component pieces of knowledge organized in the form of a system. Another characteristic is that use of complex knowledge depends on methods that are not mere algorithms. The complexity of such knowledge also comes from the fact that corresponding conceptions—the cognitive constructs— of one person can be very different from those of another person.

Moreover, these complex cognitive constructs are difficult to understand, to model, and to communicate. Thus current research on students' learning, understanding, and knowledge acquisition is substantially different from that of just a few decades ago.

Explicit—Tacit (Implicit)

Recently, Nonaka (Nonaka, 1994; Nonaka & Takeuchi, 1995; Nonaka & Konno, 1998) formulated a theory of knowledge that recognizes basically two different kinds of knowledge, explicit and tacit. Nonaka's distinction of explicit and tacit knowledge has been seminal.

Explicit (codified) knowledge is formal in character. It can be expressed in words, numbers, symbols and graphics. It can be easily communicated through print and digital media and shared in the form of data, formulas, pictures, drawings, codified procedures or general principles.

Tacit knowledge is personal and context-specific. It involves cognitive aspects such as mental models, scripts, and schemata. It also includes subjective, intangible factors such as beliefs, perspectives and values, as well as hunches, intuitions, and insights. It may be tied to the senses, related to skills in body movement, or embedded in personal perceptions or physical experiences. Tacit knowledge is thus often very difficult to describe to others.

However, beyond this distinction between explicit and tacit knowledge are knowledge production, transfer and use models such as those developed by Nonaka and Takeuchi (1995) (see also Leonard-Barton, 1995). Beginning with the individual but then moving on to groups (see communities of learners) and organizations, these models conceptualize a "knowledge spiral" among four interactive methods of knowledge conversion: socialization (tacit to tacit), externalization (tacit converted to explicit), combination (explicit to explicit), and internalization (explicit converted to tacit).

Through socialization, tacit knowledge is shared through participation in joint activities that may produce shared mental models, routines, expectations, metaphors or even micro-cultures that are employed as frameworks for social or work interaction. Successful socialization requires that participants empathize enough to relate to each other's feelings and incorporate each other's beliefs, feeling, emotions, perceptions and sense-making. These kinds of exchanges usually require protracted shared experiences.

Externalization labels the process by which tacit knowledge is converted to explicit knowledge. Through this process, intuitions, images, sense-making schema, and the like may be transformed into explicit statements, metaphors, diagrams, concept maps, hypotheses, plans, models or other tangible forms.

Combination describes the more familiar area of public knowledge and academic knowledge. Here, explicit knowledge from different disciplines, fields, or practice areas are analyzed, compared and contrasted, evaluated, and synthesized. This is the explicit form of knowledge

that is commonly produced and communicated through books, journals, and other publications and depicted in other tangible media forms.

However, our conventions of scientific discourse through print media, especially in refereed journals, tends to distort and obscure the actual processes of knowledge creation. Authors are typically required to fit their research into prior theoretical frameworks and logical structures that often have little resemblance to the actual process of discovery and interpretation. Page limitations further curtail what can be published. This leads to an additional impediment that becomes apparent when we examine much of the educational research literature. With a rapidly expanding education research literature, "thicker" forms of explicit literature such as case studies, in-depth descriptions, or reflective essays have become less likely to appear in refereed journals. Yet, these are the types of research that are more likely to be understood and appreciated by practitioners.

Through the process of internalization, explicit knowledge is converted to tacit knowledge, usually through learning by doing and through application or implementation.[4]

The concept of the "spiral of knowledge" as conceived by Nonaka and Takeuchi involves at least two important propositions. First, knowledge creation is amplified in greater than a linear fashion when all four forms of knowledge conversion are deliberately pursued and reflected against each other. Second, the spiral emerges when the interaction between tacit and explicit knowledge is elevated from a lower level, the individual, to higher levels, e.g. the work group, a community of learners, or an entire organization.

When we refer to the "gap" between educational researchers and practitioners, the analysis is typically centered on failures in formal communication, that is, transfer of explicit knowledge. However, on further reflection, it becomes apparent that the "gap" is rooted in failures in knowledge transfer involving all four areas in this "knowledge spiral." This model of knowledge posits that the basis of all knowledge creation is the mobilization of tacit knowledge. However, the majority of our educational research journals are concerned with combination, the explicit to explicit knowledge conversion which is least directly associated with tacit knowledge. Moreover, this model (but see also Glaser et al., 1973; Rogers, 1995) makes obvious that unless successful socialization between researchers and practitioners occurs on a close and frequent basis, with participants truly understanding and empathizing with each other, efforts to transfer knowledge are likely to fail. In the absence of effective socialization the concept of "two cultures" that fail to communicate with each other will be perpetuated. Now it is significant that recent proposals advanced by the National Academy of Education (1999) and the NRC Strategic Education Research Plan, (National Academy of Science, 1999) call for field-based collaboration among researchers and practitioners for more sustained periods of time.

[4] Although not explicitly associated with Nonaka's model, the Concerns Based Adoption Model (CBAM) in the field of education also attends to tacit knowledge in program adoption at various stages in the adoption process. This is particularly apparent in the concept of Stages of Concern. The concept of concerns is defined as "The composite representation of the feelings, preoccupation, thought, and consideration given to a particular issue or task" (Hall & Hord, 1987; see also Hall et al. 1979)

Individual—Social.

As noted above, there has also been a major shift from thinking about knowledge as residing with individuals to thinking of knowledge as embedded in a group or community. Perhaps, it is our experiences in school (e.g., "Do your own work") that have reinforced the conception of learning as an individual activity. However, studies of knowledge use in organizations reveal that adults encounter very different experiences in which knowledge is developed and actively shared within work teams. Moreover, the social structures extend well beyond work teams or communities of learners. William Paisley elaborated ten systems affecting the production, transfer and use of knowledge from the particular perspective of the individual researcher. The following is a paraphrased adaptation (Paisley, 1968, pp. 106-109). Paisely observed that systems affecting the researcher form a set of almost concentric circles. Progressing from the outer extreme there is:

> The researcher within his or her culture. However little control we have over it, we should not underestimate the cultural system, both as a tradition and as an ambient spirit. It is the cultural system that awards Nobel Prizes, emphasized priority of discovery, established great private foundations, and supports universities. The effect of the cultural system is so pervasive that it tends to be overlooked.
>
> The researcher within a political system. Contemporary political factors powerfully affect the American researcher. One is a scientific nationalism in many fields that causes him or her largely to ignore foreign research. A second is the present strength of scientific federalism: the money begins in Washington.
>
> The researcher within a membership group. Existing both within and beyond the political and cultural systems, but affecting a smaller number of people, is the membership group. When the researcher answers "What do you do?" by saying, "I'm a psychologist," he or she is identifying with a professional membership system. Other systems may command loyalty, but the membership system probably controls the "official" information channels in the field. The membership system may govern the researcher's appearance on its convention programs, appoint the researcher to an editorial board of its journals, and so on.
>
> The researcher within a reference group. The next system includes other researchers with similar training and area of specialization, similar quality of work, and other characteristics. Whereas the researcher might not attempt to save every paper or reprint received from others in their membership group, the researcher might maintain a file for their reference group. Reference group identification for our researcher above might be "social psychologist studying human information processing behavior." A reference group need not be contained within a membership group; the reference group of researchers studying human information processing is drawn from several membership groups. A reference group may control a journal or two, but rarely controls an entire information system.
>
> The researcher within an invisible college. A special subsystem of the reference group system is the invisible college the researcher may belong to. This is usually a small, highly select group of researchers with common interests in a particular research specialty who communicate frequently about this research area, exchange draft research plans and papers, review and critique each other's work, share data, and may collaborate in conducting their research activities.
>
> The researcher within a formal organization. This system emphasizes roles, lines of responsibility, and products, rather than people themselves. Both in the facilities it provides and in the policies it sets, the researcher's formal organization (the employing organization) opens or blocks channels of information.

> The researcher within a work team. A subsystem of the formal organization is the work team. This most important information system is tuned to the researcher's problems. It documents the history of its projects in an informal and idiomatic way. Knowing what the researcher doesn't need to be told the work team provides the researcher with rich, nonredundant information through conversation.
>
> Two other rather depersonalized systems cut across these previous systems.
>
> The researcher within a legal/economic system. This is a system of copyrights, patents, corporate secrecy, competitive research and development, etc.—all profoundly affecting the flow of information. In addition, the economic system determines the quality and quantity of information that other systems, such as membership group and the formal organization, can afford to buy.
>
> The researcher within a formal information system. Libraries, technical information centers, and the like constitute the formal information system. In most fields of science, the formal information system is actually a marketplace of competing information systems. Each finds its unique function and audience.
>
> The researcher within his or her own head. In this regress of systems, we finally come to the individual's cognitive system. This is a system of motivation, intelligence, and creativity, of cognitive structures, of perceived relevance of information inputs and uses of information outputs. Ultimately, all other systems support this one. If nothing happens in this system, then nothing happens.

The researcher is found within many other social systems, but these ten, Paisley believes, have the greatest effect on the researcher's production and consumption of knowledge. Paisley's prime focus is on individuals (and their cognitive systems) operating at the center of many social systems. Although Paisley's focal point is on the researcher, many of the systems he identifies exist (or have analogues) for educational practitioners. Paisley and many others have examined the social transactions and contexts that affect the production, exchange, and use of knowledge.

Although derived from studies of commercial work groups, Lave and Wenger's book, *Situated Learning* (1991) and Wenger's *Communities of Practice* (1998), which we have mentioned previously, seem to have made a substantial impression on the field of education. In the most recent publication, *Cultivating Communities of Practice*, Etienne Wenger, Richard McDermott, and William M. Snyder (2002) argue that while communities form naturally, organizations need to become more proactive and systematic about developing and integrating them into their knowledge production and use strategy. This book provides practical models and methods. Through cases from firms such as DaimlerChrysler, McKinsey & Company, Shell, and the World Bank, the authors demonstrate how communities of practice can be leveraged to drive overall strategy, tie personal development to organizational goals, transfer best practices, and recruit and retain talent. They define the features of these communities and provide guidelines to support communities of practice through their major stages of development.

In this series of books Wenger makes the case that knowledge is developed as people actively participate in the practices of a social community, for example, a family, work team, or interest group. (Reflecting back to Paisley's systems, clearly the work team, but perhaps also the invisible college or the reference group might serve as Wenger's communities of practice.)

The Research—Practice Gap

We have previously commented on some of the reasons for the gap between research and practice that makes transfer of knowledge between researchers and practitioners so difficult. We return to this vexing issue. A substantial body of evidence exists that practitioners, no matter what their field of practice may be, do not turn to research findings in developing or refining their practices. Similarly, researchers generally do not turn to practitioners for inspiration in formulating their research questions or for insight in interpreting their research results. Discussions of the causes for this ubiquitous situation have been widely debated for decades.

The pervasiveness of this gap has provoked scholars to conclude that fundamentally, the gap is rooted in researchers' and practitioners' basic assumption and beliefs, dissimilar frames of reference, and in profound cultural differences. Thus, sense-making, evaluation of knowledge claims and warrants, and the construction of knowledge models and relationships are markedly different. Indeed the personal and professional goals they seek, the social systems in which they live, and even the time frames they confront in addressing problems differ. Researchers and practitioners live in different communities of practice with markedly different values, beliefs, and ideologies.

However, there is a different body of literature that points to the benefits of researcher-practitioner communication and collaboration.

Pelz and Andrews (1976) were among the first to note the advantage of working close to practice settings. They found that corporate researchers who worked on assigned applied problems, who spent at least part of their time in practice settings, and who assumed boundary-spanning roles in addition to conducting pure research tasks were the most productive researchers. In the organizational research field, Ryes, et al. (1999) found that researchers who spent more time at organizational sites reported greater personal learning than those who spent less time, and perhaps more importantly, that their research was cited more frequently by other researchers. Louis, et al. (1989) found that the most successful academic researchers in the life sciences tended to have the highest levels of interaction with practitioners. Cohen et al. (1998) made similar findings for researchers in the physical sciences. Thus there is substantial evidence that indicates that the divide between the two communities of researchers and practitioners can be bridged, when researchers spend more time with practitioners in the world of practice and use those experiences to influence the formulation of research problems and the interpretations they make of their research findings.

Within the field of education these findings about the advantages of collaboration between researchers and practitioners have been noted. Such forms of collaboration are among the basic design concepts undergirding the Strategic Education Research Plan (SERP). The SERP would promote new, long-term collaborations among the research, practice, and policy communities; give educators a voice in defining the problems to be studied; and spur the development of institutions that further the demand for research. The SERP in particular pays attention to "critical mass" with "requisite variety" (including researchers and practitioners) working in school-based settings over substantial periods of time. The National

Academy of Education (NAE) "Recommendations Regarding Research Priorities" (1999), echoes a similar theme, and again with a concern that these types of education R&D programs should be conducted in field- and practice-based contexts:

> A general theme of the findings and recommendations is that progress toward high achievement for all students has been impeded by the belief that research, students' learning, and teachers' learning can be studied in isolation from important matters of context. Research should not be assumed to be separate from efforts to improve educational processes, but rather to be part of collaborative activities that may be conceived as problem-solving research and development. (NAE, 1999, p. 8.)

Both the SERP and the NAE "Recommendations" embrace the conception of supporting R&D that is conducted in "Pasteur's Quadrant."[5] However, they go beyond Donald Stokes' image of a lone Pasteur to call for collaboration among groups of highly qualified researchers and practitioners who could collectively engage in disciplined inquiry and reflection as they proceed to engage in long-term programs of R&D situated in school-based contexts.

This recent interest in conducting much more research in Pasteur's Quadrant, as envisioned in the SERP, directly addresses the need to create conditions and contexts—long-term, field-based, collaborative work, focused on significant educational problems, with critical mass and requisite variety among both researchers and practitioners—that might engender much more productive research outcomes. Among those outcomes there would likely be a much deeper understanding (and appreciation) of the complexities of creating and transferring usable scientific knowledge bearing on real educational and social problems. Perhaps only after we have gained more experience in conducting these kinds of efforts will a sufficient number of education researchers and policy makers really begin to comprehend and appreciate the complex nature of the research-to-practice challenge.

If we look to other disciplines and fields, we find that virtually all of the physical sciences are complemented by and closely linked to various engineering professions. These professions serve as the critical links between science and practice. Moreover, we find that appropriate literature and job aids (e.g., case studies, handbooks, failure analysis findings, codes, protocols, software) as well as intensive preparation and continuing education programs support all these engineering professions. Education has at best a very primitive, disorganized, and relatively ineffective engineering counterpart. (See Wilson & Daviss, 1994.) Hence, the applied aspects of education research knowledge transfer are very weak.

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[5] *Pasteur's Quadrant : Basic Science and Technological Innovation* by Donald E. Stokes (1997). Washington, D.C.: The Brookings Institution. In *Pasteur's Quadrant* Donald Stokes argues that Bush's distinction between basic and applied science was conceptually flawed to begin with because the scientific enterprise is not a one-dimensional progression from fundamental research to useful outcomes. Rather, it can be represented by a two-dimensional figure, with utility providing one axis and the fundamental/applied continuum providing the other. Stokes uses the example of Louis Pasteur to argue that research can be both basic and useful. In Stokes' figure there are four quadrants but it is Pasteur's quadrant which can lead to broadened support for basic research while yet providing useful information. Stokes provides a framework for a new relationship between science and society, one that recognizes utility as a driving force for science, rather than simply its eventual consequence.

No matter how rigorous our disciplinary knowledge (sociology, psychology, anthropology, economics, neurology, etc.) may become, it must be complemented with engineering (development) knowledge regarding applications, scaling-up, institutionalization, and the like. We must create appropriate "engineering" professions in the field of education.[6] If these professions are not developed, then most practical R&D applications problems (such as going to scale) are likely to remain unsolved. And most education R&D, no matter how high its quality, will likely remain justly accused of being impractical, irrelevant, or grossly ineffective in addressing BIG education problems in satisfactory ways.

If utility is seen as important, then perhaps some of the analysis should start from the use end of the education research application problem. For example, back-map from outstanding examples of educational improvement to try to identify the "plausible" causes, and where and how (if at all) did the results of research play a part. One might consider applying a "contingency" theory of user contexts. What kinds of R&D outputs are likely to have greatest impact given specified contexts? For example, consider the differences that exist between a "community of learners" in a high performance school and the staff in a typical school. Currently, OERI seems to be especially concerned about what works in developing procedural knowledge for transforming schools when contextual conditions are unfavorable, e.g., in impoverished, low social capital communities, and in schools with high administrative turnover, inexperienced teachers, inadequate professional development or insufficient district support.

While we are sometime quick to invoke the medical model with its randomized experiments, we usually fail to take into account such factors as: (1) the relative number of dollars spent on development and field trials versus the dollars spend on research, (2) the dollars spent by drug and medical device firms to advertise and disseminate R&D-based medical products, (3) the professional development knowledge "infrastructure" such as post-mortems, grand rounds, board certification, refereed protocols, medical practice review boards, or malpractice liability. Powerful medical research application is supported by an extensive practice application infrastructure. The research-to-practice infrastructure in education is far less developed.

In most fields where there are effective research-to-practice connections, the "order of magnitude" rule generally applies, that is, for every one research dollar, there may be ten development dollars, 100 dissemination dollars, and 1,000 implementation dollars. In the field of education we rarely get much beyond low multiples, e.g., increases of two or three times, for the progressive stages. As education becomes more critical in terms of national priorities, there may be some greater concern about addressing this research utilization problem. We do need to look at what may be learned from the engineering professions.

Perhaps much more attention should be given to R&D synthesis designs, as well as designs for information dissemination programs targeted to needs and styles of different kinds of

[6] Wilson & Daviss (1994), sensitive to language, have suggested using the umbrella term, "planning professions." Among these professions, they name educational architect, instructional designer, teacher-leader, content-educator, change facilitator, and education systems integrator as examples.

users. How do various "practitioners" (policy makers, administrators, teachers, and lay persons) evaluate different kinds of R&D syntheses? And how do these evaluations relate to the evaluations made by educational researchers? This comment is related to the RAND Study Panels on "Investing in Research," but not quite the same. What we do know from research is that various types of education practitioners have some quite different needs for and styles of information use. The kinds of information they value differ. And some of the kinds of information they frequently ask for is often missing from the education research base, e.g.: cost comparison studies, long-term effects studies, in-depth analyses of effects for different populations (students, teachers, types of schools, communities, etc.).

# # # #

A Highly Selected Knowledge Utilization Literature Review

The literature related to knowledge utilization in the field of education is immense. However, only a modest fraction of this literature is based in research or evaluation studies.[7] In the following we shall summarize only a few key documents but each of these works reference large bodies of literature.

Knowledge Production and Utilization in Educational Administration (Eidell & Kitchel, 1968)

This early book on KU is based on seven papers prepared for a University Council on Educational Administration seminar that examined various facets of problems in the application of knowledge to practice. Throughout the book, the authors call for the development of new organizations, new roles, and new training programs to facilitate research and the application of research findings in the practice of educational administration. The following paraphrases the Eidell and Kitchel summaries.

In Chapter 1, Launor Carter describes steps in the utilization of new developments in the military, public welfare, and education. He then considers various aspects of information transfer as a national problem, and concludes with seven recommendations about the proper role of knowledge development in our culture.

In Chapter 2, Norman Boyan focuses on the need for improved educational development activity, but cautions that research and development should be viewed as a collective concept and enterprise. Boyan traces the history of government support of R&D in educational administration and then proposes creation of a network of institutions for inquiry, development, and preparation of educational administrators.

In Chapter 3, Egon Guba notes the lack of a "middleman" role between knowledge producers and the user as a major problem in knowledge utilization. He describes that role and also

[7] More than a score of ERIC descriptors are needed in order to accomplish even a moderately comprehensive search of the ERIC database. These descriptors will retrieve tens of thousands of unique items. Even when the search is confined by publication types to evaluative/feasibility reports (Pub. Type 142) or research/technical reports (Pub. Type 143) approximately 10,000 documents are found.

stresses the importance of relevant evaluation techniques to both development and diffusion activities.

In Chapter 4, Ronald Havelock also focuses on the linking roles—emphasizing the roles needed to retrieve basic or applied knowledge, derive practical implications from it, and distribute to people who can use it. He considers the characteristics and skills needed by linkers and what kinds of institutions need to be created to make linkage a permanent part of the national educational system.

In Chapter 5, Sam Sieber identifies four aspects of the public education system which distinguish education from other systems: vulnerability to the social environment; professional self-image and values of educational personnel; diffuseness of education goals; and need for coordination and control of the primary clients as well as of employees. Following an analysis of these four organizational attributes, Sieber outlines existing strategies for change and offers an alternative strategy.

In Chapter 6, Richard Schmuck contends that despite the abundance of research knowledge available, little of that knowledge seems to influence administrator practice. New technology is needed for transforming behavioral science knowledge into effective practice. He outlines two training event models as one aspect of such technology.

In the final chapter, Keith Goldhammer points out that implicit in the call for greater knowledge utilization in education is the need for administrators who are prepared for specialized roles in the schools. Goldhammer describes how preparatory programs should be modified to train administrators. In a section headed, "The research to application myth," Goldhammer writes (p. 176):

> I am impelled to doubt that in a practical profession based upon human relations, a progression is or can be from research to development to use. There is little to be gained from the shotgun approach of just searching for new knowledge with the hope that somebody might follow in our footsteps to find some practical use for it. The search for applied knowledge begins, I believe, in the recognition that some serious tensions arise as a result of being faced with a problem which is beyond the ability of present scholarship to solve . . . I would suggest that a more reasonable progression in the chain than the one which proceeds from research to development to use is that which goes from experience to experimentation to diagnosis, to research, to application, to further experimentation, and so on, constantly recycling the process.

From this perspective, Goldhammer advocates a conception of the school administrator as a clinician who is a participant in knowledge production and use.

Improving Schools: Using What We Know. (Lehming & Kane, eds. 1981)

A decade later than the University Council on Educational Administration seminar, the Far West Laboratory for Educational Research and Development, with funding from the National Institute of Education, commissioned six scholars to take stock of research in the

field of education knowledge utilization. Rolf Lehming and Michael Kane, then at NIE, but in their private capacity, served as editors for this book. Drawing from the perspective of the many dissemination activities that had been funded by the federal government over the previous decade and a half, these scholars prepared a critical state-of-the-art review of research on educational change and knowledge use in education. Their aim was to state explicitly what could be learned from the studies they reviewed and to provide a foundation for future research. (We again paraphrase the editors' summary of the book chapters.)

Ernest House examines three broad perspectives underlying various federal school improvement policies. House labels them technological, political, and cultural. The technological perspective embodies a production image. Teaching is seen from this perspective as a technique that can be analyzed by subdividing it into components and improved by developing better teaching forms and diffusing them to schools and teachers who adopt them and put them into practice. The political perspective rejects this mechanistic view. Interests of various groups come into play in any significant educational change effort. Conflict, bargaining, and the application of political, economic, and bureaucratic power exert influences on the dynamics of a major change effort, often modifying the outcomes in ways that are hard to anticipate or control. More fundamentally, the cultural perspective looks to basic differences in values and beliefs. The cultural perspective emphasizes the need to affect changes in meanings and values of those within the organization. And it also explains why resistance can be so intractable and changes so slow when an innovation runs counter to deeply held values and beliefs or when change activity forces different micro-communities within an adopting system to confront differences in values and beliefs that had heretofore remained unexamined.

Matthew Miles analyzes in substantial detail what we need to know about the school as an organization type. What are the relatively stable properties commonly found among contemporary American schools? Miles discussion is organized around nine dilemmas or choices facing schools (as well as other organizations):

(1) Core task focus versus "survival" emphasis
(2) Diversity versus uniformity
(3) Coordination versus flexibility
(4) Environmental dependence versus autonomy
(5) Environmental contact versus withdrawal
(6) Environmental expertise seeking versus self-reliance
(7) Feedback seeking versus intuitive/routine action
(8) Centralized versus shared influence
(9) Change versus stability

Miles chapter covers a broad range of research in considerable depth. Tersely, here are his main conclusions. Basic descriptive data are scarce on all these organizational dimensions. Further, most causal claims for school behavior remain untested in any empirical sense. Among the regularities in the findings of many investigations, regardless of the approach, is that schools have vague goals, whose achievement is difficult to assess, schools are vulnerable to their environments, have weak production functions, and have inappropriate incentive structures.

Sam Sieber picks up on Miles' complaint about incentive structures, and presents a framework for the systematic examination of incentives and disincentives of school personnel. His analysis of the available literature focuses on the individual but he concludes with a discussion of organizational incentive systems. He faults the then current knowledge use strategies (see summaries in Havelock, 1969, and Zaltman et al., 1977) for indiscriminately lumping their limited set of incentives together in ways that obscure effects. Sieber observes that the literature on educational diffusion, innovation, and change has failed to properly integrate work on organizational incentives and occupational communities. He states that this is not merely a theoretical failure, but one that is reflected in knowledge use policies based on these flawed strategies. Sieber notes that, typically, these KU policies tend to emphasize a limited range of benefits without considering the noneconomic costs they may also entail, fail to deal effectively with the competing benefits of inaction, and employ sanctions against inaction that are likely to arouse resistance.

Sieber then analyses the evidence regarding incentives and disincentives for KU in: the nature of the R&D enterprise, the nature of the schools' environmental relations, the organizational characteristics of schools, and the occupational culture of school personnel. Perhaps one of his most cogent suggestions is that use of knowledge for personal and professional enlightenment may be the strongest, and yet least used lever. Sieber concludes from his review of the research that many KU strategies generally have social costs that exceed their benefits. Problem solving strategies provide weak incentives for KU because they too often disregard the interplay among alternative solutions and definition of needs. He further observes that too little is known about concrete operational incentive of school personnel to guide formulation of effective KU policy. Finally, too little heed is paid to organizational incentive systems and too little is known about these systems.

Michael Fullan examines school-based KU and change processes by reviewing what is known about persons serving in four key positions—teachers, principals, district specialists, and superintendents. He describes major dimensions knowledge types and use types, discusses key aspects of the school setting, and then presents critical summaries of the research relevant to each group's KU behavior and roles in school change. This analysis is highly detailed, carefully documented, and meticulously evaluated. However, it becomes both difficult and tedious to encapsulate the wealth of information Fullan presents on each of these four key positions in a few summary sentences. Fullan concludes that the (then available) research on the KU behavior of these four groups and their roles in school improvement processes is on the whole poorly developed. Moreover, it suffers from undifferentiated conceptions of KU, and pays far too little attention to different levels of schooling, size of school and district, location, and populations served. He wraps up with comments on the implications these deficiencies for planning, implementation, and assessment of outcomes of KU efforts.

Complementing Fullan, Karen S. Lewis synthesizes the literature on roles, functions, and efficacy of external agents in various KU programs, that is, inviduals, groups, and organizations located outside the school improvement district site. She notes that use of such external agents to support education improvement, although inspired by the agricultural cooperative extension model, is complicated by organizational and cultural differences between

agriculture and education. She notes that available research on external agents in education is devoid of theory and suffers from other limitations, notably: an overemphasis on instrumental, decision-oriented KU, a preoccupation with use of research knowledge, and a data base limited mostly to studying "technology-push" approaches. She presents the evidence on effectiveness and impact of external agents and relates these findings to various conditioning factors such as qualities of the agent or likeness between the agent and client. Lewis reviews what was then known about various external agent strategy elements—degree of initiative, intensity of interaction, types and mixes of expertise, scope of client concerns addressed, and cost. She notes that while some evidence is available on most of these elements, only judgmental information is available on two critical issues: How scope, cost, and benefits are related, and what skill mixes are appropriate in particular situations. She concludes with a research agenda needed to fill the gaps she identifies.

Paul Berman provides the concluding chapter in this book. Berman observes that research on education change is shifting from relatively simple views prevailing in the 1960s to more complex images of how schools actually change. He argues that the major significance of recent research lies not so much in its detailed findings, but rather in emerging perceptions of the complexity of educational change processes. Berman makes this proposition explicit by formulating a new paradigm to guide future research and action. He explains how accumulating evidence gradually undermined assumptions and approaches underlying House's "technological perspective." Berman characterizes the emergent paradigm by three "meta-propositions," that is, ways of thinking about educational change deriving from its emerging empirical foundations. He proposes that educational change is typically implementation dominated; that it involves complex organizational processes that are loosely, not linearly, connected; and that its outcomes are heavily time- and context-dependent. He then expounds on the implications of these meta-propositions for the conduct of research. He argues that future research, for the time being, should abandon attempts to discover universal generalizations about how schools change, in favor of exploring in much greater depth how specific types of school contexts condition the change process. The research must incorporate time-dependent measurements and longitudinal research designs, and it must structure its analyses so that contingent context effects can be discovered instead of remaining hidden.

Knowledge Utilization Systems in Education: Dissemination, Technical Assistance, Networking. **(Paisley & Butler, 1983)**

In this anthology compiled by William Paisley and Matilda Butler, 27 researchers and program managers provide the 16 chapters and nine case studies found in the volume. While the scholars contributing to *Improving Schools* focused primarily on critical reviews of relevant research, this contemporary Paisley and Butler volume provides a wealth of details about operational educational KU systems. In their introduction, the editors provide capsule summaries of the three kinds of knowledge utilization activity systems that are featured in the book. We quote directly:

(1) *Dissemination* of information from educational research, development, and practice. Initially, in the federal view, dissemination involved only printed media

and bibliographic information systems. By 1970, however, the federal government was experimenting with "educational extension agents" who extended the outreach of the other dissemination activities.

(2) *Technical assistance* provided to educational decision makers, administrators, and practitioners. Educational practices and, in particular, educational regulations became increasingly complex in the aftermath of "Great Society" legislation. Educators needed information and skills that were adapted to local settings, local problems, and local resources. Dissemination systems were not adapted in this way. Even the educational extension agents, who might be familiar with local factors, could not provide adapted information that was missing from the dissemination system in the first place. Technical assistance specialist constituted a different kind of professional. Drawing upon their own experience as well as the dissemination system, technical assistance specialists could provide adapted information and advice to educators. Under many authorizations from the 1960s to the 1980s, technical assistance specialists have worked with local personnel on problems of needs assessment, program development, evaluation, staff training, and so forth.

(3) *Networking* in support of knowledge utilization assumes that expertise is shared by educators in a peer network; they are each other's technical assistance specialists. Many complex topics (such as statistics, finance, law) are, and will probably continue to be, associated with specialists' expertise. However, many "how-to" topics in education are associated with peer expertise. At the local level, teachers' centers have been established to facilitate the sharing of peer expertise. At the regional and national levels, networks of educators with common concerns (including open education and sex equity) have arisen—in some cases spontaneously, and in others as components of change programs.

Again, we shall paraphrase from the editors' description of the book's content.

> "This book tells some of the history, current status, and future prospects of educational knowledge utilization systems."

The first section, Origins, describes the educational and political preconditions for the emergence of educational dissemination systems between 1965 and the late 1970s. Paisley's chapter on The Historical Context traces trends in educational enrollment, government funding and other factors. John Coulson's chapter, Federal Education Dissemination, Legislation and Policy, provides a comprehensive review of shifts in the federal perspective on change vis-a-vis its roles as coordinator, facilitator and direct participant. Coulson notes that, as of 1980, there were 46 dissemination programs in the Department of Education alone.

In the book's second section, Approaches, a wide range of systems and programs are covered in eight chapters. Lee Burchinal, the director of the ERIC system during its formative years, describes that system. Karen S. Lewis describes two historic extension programs, the Pilot State Dissemination Program and the Research and Development Utilization Program. Diane McIntyre and Sharon Entwistle describe the National Diffusion Network. Bill Hering summarizes the history of the Teachers' Center movement from the emergence of the centers in the late 1960s through to the early 1980s. Lynn Jenks, then Director of Far West Laboratory's regional services,

describes the provision of technical assistance through regional service programs. Jenks illustrates the dynamics of regional services with an example of school improvement planning in Nevada. Carl Martin reports the outcomes of a survey of dissemination activities in state departments of education, to which all 50 states responded. Paul Hood and Carolyn Cates summarize their understanding of interorganizatonal arrangement for knowledge utilization. In the final chapter of this section, Virginia Cutter describes how the state of Texas assembled a unified knowledge utilization activity from the funding of several federal and state programs.

The third section, Issues, begins with a chapter by Paisley who recounts the problems of estimating and attributing cost of local extension programs. In the course of that costing work, Paisley develops taxonomies of extension outputs and outcomes as a framework for cost analysis. Matilda Butler reports on two exploratory studies of "information equity." Susan Peterson and John Emerick provide a synopsis of their review of five key studies of educational knowledge utilization, including summary tables outlining the assumptions, strategies, and findings of the five studies. Everett Rogers and Jane Marcus discuss advances in diffusion theory. They conclude that recent experiments have reaffirmed the importance of interpersonal communications, demonstrated the advantages and the disadvantages of "decentralized diffusion," and suggested a complementary relationship between diffusion theory and social learning theory. In the last chapter of this section, Paisley and Butler envision the status of educational knowledge utilization in 2001. (If one translates their conception of the electronic bulletin "board" to be the world wide web, then indeed, many of their predictions have been realized.)

Nine brief case studies of educational knowledge utilization systems and center are compiled in the final section of the book. Managers of the activities described prepared most of these case studies.

School Models and Processes: A Review and Synthesis of Research and Practice **(Sashkin & Egermeier, 1993)**

Fully a decade following the Lehming & Kane and the Paisley & Butler volumes, Marshall Sashkin and John Egermeier, both then at the Office of Educational Research and Improvement (OERI) undertook a 30-year retrospective of the research on school improvement. Their synthesis attempts to responds to the need for research-based information on school change by providing historical background, examining how improvement actually happens, and exploring effective strategies. The authors describe three major waves of reform: the first centered on transferring innovations; the second predicated on state-level mandates; and the third focused on achieving systemic reform.

Sashkin and Egermeier describe various perspectives and strategies. They assert that the three most influential perspectives are those elucidated by Ernest House (see *Improving Schools*) namely: (1) the rational technological perspective, which posits that change is achieved through the dissemination of information about effective instructional methods,

successful strategies for solving problems, and research-based products embodying these methods or strategies; (2) the political perspective, which views change as essentially a political process of negotiation and bargaining (and is reinterpreted by S&E as focused mainly on supporting change imposed on schools from sources external to the school or district); and (3) the cultural perspective, which emphasizes changes in meanings and values within the organization undergoing change.

However, the major body of their synthesis is organized around four principal strategies employed for school improvement: (1) fix the parts (curriculum, teaching methods); (2) fix the people (professional development); (3) fix the schools (institutional development); and (4) fix the system (systemic change). In their report, the authors review school reform and improvement efforts employing each of these strategies.

Fix the parts. This is an innovation-focused strategy. The assumption is that through dissemination of research-based products and practices schools can be improved. The authors note that after many years of experimentation, we now know that that this strategy is, at best, a partial solution. When dissemination consists primarily of stand-alone information or simply packaged products potential users may be unlikely to adopt the innovations. In contrast, the more dissemination involves personal assistance and continuing support from skilled, knowledgeable and trusted assistance providers, the more likely the innovation will be adopted or adapted, and maintained. As the authors note: "Educational reform involves much more than just 'getting the word out' about new and better practices."

Fix the people. This is the training and development approach. (We quote from the Executive Summary)

> What we know today is that most staff development activities have very little impact, regardless of how well designed or effectively delivered they are. The reason is simply that people are far more likely to bow to the strong expectations of their organizations—their schools—than persist in trying new and different ways of professional action. Only when staff development is part of an overall strategy for professional and institutional reform can this strategy succeed. (p. v.)

Fix the schools. Various approaches have been developed that are aimed at changing an entire school system. Typically, the efforts focus on developing organizational capacity for problem solving or making improvements. Sashkin and Egermeier state that the problem with this approach is that to make it work usually calls for levels of effort and outside resources that most schools cannot mobilize. However, they note that relatively low–cost adaptations of organizational development (OD) approaches have been developed and implemented with relatively good results. Yet these approaches have failed to produce any large-scale impact.

Fix the system. This approach involves reforming and restructuring the entire enterprise of education, from the level of national education goals to state curriculum frameworks, on to school districts, buildings, classrooms and teachers. The predicated success of systemic reform is based, in part, on the incorporation of aspects of all three of House's perspectives,

but with substantial emphasis placed on the cultural perspective. "This means that systemic reform is based ultimately on the development of a strong and common purpose shared by those at the national, state, district, and school levels, both educational professionals and everyone else concerned with education in America."

The authors provide capsule summaries of virtually all of the major programs and studies with regard to each strategy. Moreover, they provide a reference bibliography with selected references illustrating both the key research studies and general guides relevant to each strategy. They also provide general references to research on educational change and general guides on educational change. The volume concludes with a section describing illustrative programs and listings of organizational resources relevant to each strategy.

Although markedly less comprehensive than *Improving Schools*, which covers 286 pages and includes another 24 pages of small-print bibliography, the 57 pages of *School Change Models and Processes* provide a remarkably compact review and synthesis of research and practice until approximately 1991-92. Of all the volumes we have reviewed in this section, this is an excellent place to start.

A Review of the Literature on Dissemination and Knowledge Utilization (SEDL, 1996)

Although this review is designed to provide information useful to those concerned with disseminating disability research results, it provides a guide that may be of use to anyone planning educational dissemination efforts.[8]

Following an opening discussion of the agricultural extension model and reasons it is not applicable in education, the review notes that "the understandings about knowledge use emerging from the recent literature reveal that the process is complex, transactional, and heavily dependent on the potential user's pre-existing knowledge, beliefs, and experiences." (p. 2) Various definitions of dissemination and utilization are then examined, including the Dissemination Analysis Group (DAG) distinction of the functions of: spread, choice, exchange, and implementation. The paper then cites Louis' (1992) critique of this definition on the grounds that it embodies the belief that knowledge comes in definable, usable units. After an extremely brief discussion of theories and models, the paper notes that no single theory or model has gained ascendancy. For those concerned with practical issues, the most important distinctions among models have to do with perspectives about the ways users play active roles in the acquisition and use of knowledge.

Dissemination is now in a third wave of activities related to understanding and promotion of KU. The first wave spanned the period 1920-1960 and the second, 1960-1980. During the second wave large-scale, federally sponsored dissemination emerged. Most of the current literature is based on that period. The paper notes that Huberman and others question whether anything new has yet been learned during the third wave, but it notes that the proliferation of electronic communications and widespread use of personal computers have

[8] The SEDL review is available on-line at: http://ncddr.org/du/products/review/index.html It is also available on-line in PDF at: http://www.ncddr.org/du/products/litreview.pdf

raised new questions and issues about equity, access, and effectiveness. Moreover, perspectives about the KU process have shifted to highlight the complexities and dynamic transactional aspects of KU. Knowledge is no longer viewed as an inert object to be sent and received, but a fluid set of understandings shaped both by those who originate it and by those who use it. Knowledge use is thus seen as a learning process.

The paper then examines constructivism learning theory and its implications for understanding information processing and knowledge use. Among the several authorities cited, Fuhrman's (1994) view is cogent:

> The research on utilization is quite clear: the meaning of research is constructed by the user . . . Individuals translate research finding through the lens of prior knowledge and understanding, making sense of new knowledge in the context of daily activities . . . It is research on learning that is the foundation of understanding knowledge utilization. (p. 138)

The review then organizes the remainder of the paper in terms of four categories:

- the dissemination source
- the content or message or product that is disseminated
- the medium, and
- the user

The discussion of the source, including both originators and intermediaries, includes sections on building relationships between researchers and users, understanding the limitations and biases of research, factors influencing credibility, and orientation of the research or linking organization.

In the section on message or content, various content attribution lists are identified. The section continues with sections on: quality of content, compatibility with user's needs and beliefs, kinds of information to include if dissemination is to be effective, and concludes with a summary of findings in the literature for transforming research into comprehensive messages for intended users.

Media and formats are then discussed. It is noted that in many cases knowledge (content) cannot be easily separated from the product, program, practice, policy, or other information vehicle that conveys it. There are many interaction effects between content and medium. This discussion continues with examinations of digital technology and equity concerns, the primacy of personal interactions, using multiple media formats, and targeting media for persons with disabilities

The section on intended users opens with the observation that new understandings point to the requirements that dissemination must address the context and concerns of potential users, attend to potential user's readiness for change, and understand the incentive likely to motivate users. Social marketing and audience segmentation are briefly reviewed along with discussion of racial, cultural and other factors that may affect patterns of information seeking or knowledge construction.

The paper concludes with a number of implications for disability research and dissemination. Paraphrasing them, they are:

- Dissemination is a process requiring a match among originated knowledge, the needs, contexts, prior experiences, values and beliefs of intended users, and the content, media, formats, and language used in getting the outcomes into the hands, minds, and activities of users.
- The goal of dissemination is utilization—the critical element is that the research outcome must be understood and the individual or organization must incorporate the new information within prior understandings and experiences.
- Involving potential users in planning and implementation of research will increase utilization.
- Effective dissemination requires understanding of KU as a process of learning and change, is critically linked to its timeliness and comprehensiveness, and requires careful planning and effort throughout the span of a research project.
- Dissemination requires ongoing support and personal intervention in order to achieve effective utilization.

Knowledge Utilization and Public Policy Processes: A Literature Review (Neilson, 2001)

One area of knowledge utilization missing in the previous publications is public policy. This review conducted by the Evaluation Unit of the Canadian International Development Research Center nicely covers this area. Although written from the standpoint of national development programs, the review provides a general overview of policy KU, including definitions, discussion of the Two Communities Theory, the "enlightenment function" of research, analysis of several policy process models and their implications, and discussion of key issues. The report is moderately extensive (44 pp.). Below we very briefly summarize its content. We urge readers interested in policy knowledge use to access the on-line report.[9]

This paper addresses the issue of the influence of research on policy. The first section presents an overview of the KU literature including views on the use of knowledge and research in policy decision-making. The two most enduring findings from this literature are: the two-communities theory regarding behavior differences or "culture gap" between researchers and policy makers, and Carol Weiss' conception of the "enlightenment function" of research. Various ideas and meanings of research and use are also considered.

The second section summarizes various policy process frameworks, including: (1) the linear model, (2) incrementalism, (3) interactive model, (4) policy network model, (5) agenda-setting model, (6) policy narratives, and (7) policy transfer model. Each of these seven conceptions has different implications for the extent to which research influences policy, for how research should be designed, and for who are considered to be the main decision makers in society. The final section addresses a few key issues including: research quality, perceived influence, and new policy fields and environments.

[9] The review is available on-line at: http://www.idrc.ca/evaluation/litreview_e.html

A Short Selected List of Recent Books

Among the hundreds of books dealing with various aspects of knowledge utilization in education here are a few selected titles that may prove useful in obtaining an overview of more recent thought and practices.

Chapman, D. W., Mahlck, L. O. and Smulders, A. E. M. (eds) 1997. *From Planning to Action: Government Initiatives for Improving School-Level Practice*. Paris: UNESCO.

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Hall, G. E., George. A., & Rutherford, W. 1979. *Measuring stages of concern about the innovation: A manual for the use of the SoC questionnaire* (Report No. 3032). Austin: The University of Texas, Research and Development Center for Teacher Education. (ERIC Document Reproduction Service No. ED 147 342)

Hall, G. E., & Hord, S. M. 1987. *Change in schools: Facilitating the process*. New York: State University of New York Press.

Havelock, R. G. 1969. *Planning for Innovation*. Ann Arbor: Center for Research on Utilization of Scientific Knowledge, University of Michigan.

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