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Knowledge Alive

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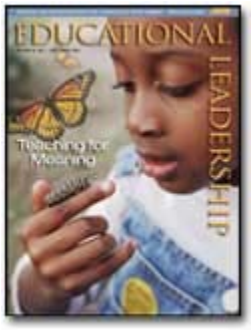

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Schools need to spend less time exposing students to large volumes of knowledge, and more time teaching them the knowledge arts.

Perhaps the broadest and most basic question for educators—before matters of method, testing, or grading—is "What should we teach?" And perhaps the most basic answer is "knowledge." Knowledge in the broad sense—facts, ideas, and skills—provides the mainstay of the school curriculum from kindergarten through college.

Fine for knowledge. But then there's the question of what you do with it. Education has always been more generous about exposing learners to large volumes of knowledge than about teaching them the diverse skills involved in handling knowledge well—the *knowledge arts*.

The knowledge arts include communicating strategically, insightfully, and effectively; thinking critically and creatively; and putting school knowledge to work out in what educators sometimes humbly call the "real world." The knowledge arts bundle together deep reading, compelling writing, strong problem solving and decision making, and the strategic and spirited self-management of learning itself, within and across the disciplines.

We need to put the knowledge arts on the table—to celebrate them for the depth and power they provide and for the ways they make knowledge meaningful. And we need to worry about their neglect.

The Knowledge Arts in Society

To get a picture of how the knowledge arts work in schools, let's start with the bigger picture of how they work in society. We can tell the broad story of knowledge in four chapters, starting with creating it and moving on to communicating it, organizing it, and acting on it.

People create knowledge in various ways. Scientists examine the sky or the sea or quarks or viruses; historians puzzle over ancient documents and artifacts; pollsters survey public opinion; engineers design and test prototypes; newspaper reporters investigate political dogfights; police officers comb for evidence about crimes. Then we communicate that knowledge in various ways: through writing and reading; mathematical equations, maps, and diagrams; news broadcasts; electronic mailing lists; and works of art. We organize knowledge in various ways for ready access (notes, concept maps, Web sites) or for particular purposes, judgments, plans, and decisions (the court's verdict, the advertising campaign, the blueprints for a new building). And eventually, we act on all this knowledge: We carry out the judgment, erect the building, or launch the mission.

Of course, the story of knowledge in the form of these four chapters is far too linear. Creating, communicating, organizing, and acting on knowledge mix with one another in complex and

generative ways. However, the four chapters provide a rough and ready overview.

The Knowledge Arts in School: A Report Card

Keeping the four chapters in mind, how well does schooling develop the knowledge arts of learners? The report card for business-as-usual schooling would look like this:

Creating knowledge: *D*

Communicating knowledge: *B*

Organizing knowledge: *C*

Acting on knowledge: *D*

The first *D* reflects the fact that in typical schools, investigative, inquiry-oriented activities in which learners create knowledge are sparse. Of course such activities occur here and there—for instance, in some kinds of science learning—but even then they often entail simply going through the motions of a laboratory experiment rather than genuinely wrestling with ideas.

Acting on knowledge also earns a *D*. We rarely ask students to do much with their learning outside school—except homework, of course. As a result, knowledge tends to become passive or inert. In both academic and practical contexts, learners fail to connect what they have learned to new situations or to act effectively on that knowledge (Bransford, Franks, Vye, & Sherwood, 1989). Students may memorize key information about biology for the science test but never ponder what that knowledge says about personal health care or public health issues.

Problems of transfer of learning have long plagued education (Bransford & Schwartz, 1999; Detterman & Sternberg, 1992; Perkins & Salomon, 1988). Typical schooling does not even encourage students to carry their knowledge from one classroom to another. Science instructors often complain that the math from math class somehow evaporates in the science room. History instructors grumble that some cognitive Bermuda Triangle in the corridor between the English and history classrooms has sucked away students' knowledge of writing.

Conventional education probably does best at communicating knowledge, so why does it rate only a *B* in this area? On the receptive side of communication, although learners spend a great deal of time loading up on knowledge, schools do not typically teach them to do so strategically. Many young readers can decode competently but have never learned to ask themselves what they are reading for, to monitor their reading as they go, to assess themselves afterward, and to fill in what they missed. The productive side of communication includes not only writing but also artistic expression, presentations, multimedia work, and so on. These areas typically receive little time or guidance, except for the mechanics of writing.

Further, some schools direct dogged attention to skill and content learning in a narrow sense, with the unsettling consequence that skills become ritualized into mere recipes to follow (Perkins, 1992). For instance, students who know how to add, subtract, multiply, and divide can become quite confused about how to apply these operations to story problems, and they often fall back on limited keyword strategies, such as "*all together* means *add*." Students learn what they are supposed to say in class without really understanding it. Science educator Marcia Linn amusingly noted what one student made of a Newtonian principle of motion: "Objects in motion remain in motion in the classroom, but come to rest on the playground" (2002).

Organizing knowledge also receives little attention in typical schools—thus, the grade of *C*. In most school settings, strategic guidance in this skill appears only during review sessions or around such products as essays. Yet learning logs, concept mapping, debates, group presentations, and many other activities can dramatically expand students' skills in organizing knowledge.

At this point, dedicated educators will object: "My kids are deeply engaged in inquiry-oriented science learning!" "My students keep learning journals and review their learning every week!"

"We stage a debate after every unit!" "Teams of youngsters are out there in the community investigating local history!" Good. These undertakings certainly cultivate the knowledge arts and deserve kudos when and where they occur. But we need to ask, How often is this kind of teaching and learning happening, and how well? Between the oases of glory stretch deserts of neglect.

Bringing Knowledge to Life

What does it look like to enliven teaching and learning through the knowledge arts? The following examples come from the work of my colleagues at Project Zero of the Harvard Graduate School of Education (www.pz.harvard.edu).

Making Thinking Visible

One way to advance the knowledge arts is to use *thinking routines* (Ritchhart, 2002) to make students' thinking visible, increasing their awareness of what goes into creating, communicating, organizing, and acting on knowledge.

For instance, Shari Tishman (2002) and her colleagues have explored a simple way to make certain kinds of thinking visible by asking two key questions: What's going on here? and What do you see that makes you say so? They adapted this approach from a procedure for examining works of visual art thoughtfully (Housen, Yenawine, & Arenas, 1991), but learners can apply these questions to many different objects—for example, a short poem or a satellite photograph of a hurricane. Or a history instructor might show a historical artifact like a crossbow, accompanied by the slightly tweaked questions, How does this work? and What do you see that makes you think so?

Tina Grotzer and her colleagues have developed inquiry-oriented activities that engage students in communicating about the complex causal models that can often make science concepts difficult to understand—models that involve such invisible features as electrons, causal loops, and simultaneous cause and effect (Grotzer, 2003; Perkins & Grotzer, 2000). For instance, 4th graders studying electrical circuits compare different ideas about what the current does. Does it start at the battery and fill the circuit, like turning on a hot-water radiator system for the first time, and then continue to cycle? Or does the current of electrons move all at once, like a bicycle chain? Young learners lean toward the first idea, but the second is more scientifically accurate. The following discussion shows how the teacher can help students make visible their thinking about the scientific explanation of electrical flow (Grotzer, 2000):

> Teacher: Let's compare how cause and effect works in these two different kinds of cyclic models. In the cyclic sequential model [as in the radiator system analogy], what makes the electrons move?
>
> Student 1: They want to get out of the battery because of all the electrons so they go onto the wire.
>
> Teacher: And then what happens?
>
> Student 2: They go along the wire till they get to the bulb and that makes the bulb light up.
>
> Teacher: Why do the electrons move in the cyclic simultaneous model [as in the bicycle chain analogy]?
>
> Student 1: The electrons push the one in front but at the same time they are pushed by the one behind them. So everything moves at the same time.
>
> Teacher: Yes, each electron repels the next one but is repelled by the one behind it. It's both a cause and an effect at the same time. The whole thing turns like the chain on a bicycle. What causes the bulb to light?
>
> Student 3: When the electrons start to flow.

Grotzer's research shows that conversations like this one, along with simple experiments and activities, can make causal thinking visible and lead to higher levels of understanding.

Teaching for Understanding

Understanding is one of the most cherished goals of education. Teaching for understanding can bring knowledge to life by requiring students to manipulate knowledge in various ways. For instance, understanding a historical event means going beyond the facts to explain them, explore the remote causes, discuss the incident as different people might see it from their own perspectives, and skeptically critique what various sources say.

A number of years ago, several colleagues and I developed the Teaching for Understanding framework, which centers on the idea of performances of understanding (Blythe & Associates, 1998; Gardner, 1999; Perkins & Blythe, 1994). Here are two examples of classrooms using this framework, drawn from Wiske (1998).

Joan Soble employed the Teaching for Understanding framework to organize and deliver an introductory writing course for at-risk 9th graders—students whom she described as "perpetually overwhelmed." The students engaged in a wide range of understanding performances, including working with collages as preparation for writing; keeping and critically reviewing portfolios; and setting and pursuing goals individually, using a form that listed writing skills they wanted to improve, from sentence structure to revision practices to aspects of self-management. Thus, these students worked directly on the knowledge art of writing, learning how to practice it with more skill, confidence, and flair. Soble's approach also helped students with another knowledge art: the thoughtful management of their own learning.

Lois Hetland's 7th grade class examined fundamental questions about Colonial America throughout the year. Some questions concerned the land: How does land shape human culture? How do people think about the land? How do people change the land? Another line of questioning concerned historical truth: How do we find out the truth about things that happened long ago or far away? How do we see through bias in sources? These *throughlines*, as Hetland called them, provided abiding points of reference for the learners. Discussing the same throughlines in connection with topic after topic helped students to develop not only a deeper understanding of Colonial America but also important knowledge arts: the ins and outs of historical inquiry and the management of their own learning through sustained questioning.

Such practices engage students in various mixes of the four broad activities identified earlier—creating, communicating, organizing, and acting on knowledge—in ways linked to the disciplines. Moreover, research has revealed something quite striking: Students who participate in Teaching for Understanding classrooms display shifts in their attitudes toward understanding. Compared with other students, they think of understanding in a more dynamic and exploratory way, rather than as a collection of facts and skills (Wiske, 1998). This stance toward understanding amounts to a knowledge art that equips students for deeper learning.

Creating a Culture of Learning

The knowledge arts—like any art—are more than skills: They involve passion, energy, and commitment (Tishman, Perkins, & Jay, 1995). Teachers promote the knowledge arts when they strive to establish a classroom culture of inquiry and excitement.

Ritchhart (2002) describes an algebra teacher who began the first day of school by displaying a mathematical puzzle problem from the newspaper, noting that a student had brought it in, saying that he loved little problems, and encouraging students to provide other puzzle problems throughout the year. Then he wrote on the chalkboard an elaborate arithmetic computation drawn from an episode in *The Phantom Tollbooth*, asking students to work out the answer and commenting that he had better figure it out himself. Inevitably, students came up with a variety of answers. The teacher gave his own answer but warned that he didn't think it was correct. He

challenged students to find the right answer.

Through these actions and others like them—informal, welcoming, and inquiring—this teacher signaled that the coming school year would bring knowledge alive.

The Second Curriculum

One natural reaction to these examples—and others from ingenious teachers across the world—is that they simply illustrate good teaching methods. They show ways of teaching content that enhance student engagement and make knowledge more meaningful.

True enough, but the knowledge arts are more than just tools for teachers to teach with; they encompass ideas, skills, and attitudes for learners to learn—a second curriculum. Thinking of the knowledge arts in this way creates new responsibilities for educators. As teachers teach science, history, or literature, they should be able to specify what skills of inquiry, strategies of communication, methods of organization, and ranges of application they are striving to develop in students; how they are spending time on it; and how they are exciting students' interest and providing serious guidance. Without such an account, the second curriculum does not exist in any substantive sense.

The bad news: All this amounts to one more agenda in an era in which educators must prepare students for high-stakes tests that often emphasize *having* knowledge far more than *doing* something with it. The good news: The second curriculum is not just an add-on to the first. Instead, it's a meld, a fusion, an infiltration designed to bring knowledge to life and keep it alive. Taking the second curriculum seriously will not only equip students with knowledge-handling skills they need but also deepen and broaden their mastery of the first curriculum.

Behind the second curriculum is a simple idea: Education is not just about acquiring knowledge, but about learning how to do significant things with what you know. It's not about dead knowledge, but about bringing knowledge alive. To educate for today and tomorrow, every school and every classroom should teach the knowledge arts seriously and well.

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Knowledge alive. September 2004. Educational leadership: journal of the Department of Supervision and Curriculum Development, N.E.A 62(1).Â Knowledge in the broad senseâ€”facts, ideas, and skillsâ€”provides the mainstay of the school curriculum from kindergarten through college. Fine for knowledge. But then there's the question of what you do with it. Keeping knowledge alive. Older people with special skills are teaching the younger generation via an online marketplace. Emily Dugan @emilydugan,Alan Dymock @AlanDymock.Â Keeping knowledge alive. pg10-amazings5.jpg. Alec Bell, 66, Philosophy: â€œThere is a gap between the generations now and adult education seems to have ceased to exist. Keywords â€“ Materials Experience, Materials, Experiential Knowledge, â€œAlive. Active. Adaptiveâ€ Materials. Citation: Karana, E., Nimkulrat, N., Giaccardi, E., Niedderer, K. & Fan, J.N. (2019). Alive. Active.Â 1 International Journal of Design Vol. 13 No. 2 2019. Alive. Active. Adaptive: Experiential Knowledge and Emerging Materials. The emergence of new materials as well as new approaches. to designing with materials offer a broad spectrum of opportunities. for achieving new material experiences in design. However, as.