A Consequence of Principle

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Historically, the universal teaching tool kit does not contain advanced technologies (e.g. radio and movies). Only the blackboard, introduced around 1840, is ubiquitous as an artifact of teaching. Teachers adopted and adapted any other technology as an individual option (Cubin, 1986). Driven by the reactionary political rhetoric in *A Nation at Risk* (National Commission, 1983), a standardized national curriculum is being established and computer technology is being forced upon unprepared teachers. Both invade the educative principle by compelling change through mandate. In doing so the reformers have misinterpreted the current reality of a global world (Friedman, 1999). Worse yet, they have ignored another reality—the rapidity and uncertainty of technological change. As a result, the diversity that is the intellectual strength of the United States is sorely compromised and teachers are not being served or supported in their role as cultural conduits.

The title of this essay is taken from the writings of Frank Lloyd Wright. In full, the quotation reads: "The form is a consequence of the principle at work." While his context was architecture, the concept echoes truths that can be found in many cultural systems, of which Education is one. On the surface there is an obvious cause and effect relationship through the interaction between *form* and *principle*. The usual popular simplification of his words translates into 'form follows function.' The original phrasing suggests to me that Wright was evoking a more complicated relationship than mere causality. He wanted to point out an emergent quality in his *principle* that gave form to the body of his work. I wish to evoke a similar emergent connection to the educative principle. In doing so, it is necessary to explore the context in which this occurs.

Emergence is one concept that is hard to pin down to an inclusive and satisfying definition. The term, as I am using it, comes from the new science *Complexity* (Holland, 1998). In its simplest understanding, Emergence is most often described through the metaphor of the seed. The relationship between the tree and its seed is an example of emergence: Something large morphing from something small, the whole greater than its original and individual elements. The association does not involve causality: The seed did not cause the tree. Another manifestation of emergence frequently cited is water. The emergent result of combining hydrogen with oxygen does not resemble those elements. The term is applied to a wide variety of concepts: the stock market, the weather, bird migration.

The educative principle, like Wright's principle, has two major levels, both of which are site specific. In Wright's case one is hidden within the cloak of his mind—thought and intellect; the other is seen in his concrete artifacts—architecture and furniture. Likewise, the educative principle has site specific abstract and concrete elements. The abstract element–often called vision—resides in the mind of the classroom teacher; the concrete component is the individual student affected by her. Together, these elements—the educative principle— are in the process of emergence singularly within the individual teacher, and are also in the process of emergence collectively within the teaching culture. This process is natural (it organizes itself) and evolutionary (it changes adaptively). Using the terminology of Complexity, the educative principle is a complex adaptive system. An adaptive system operates within the parameters of emergence.

In the case of Wright, the idea of genius is immediately and unambiguously evoked through his name alone. An individual's perception of his work may be positive or negative, but the universal response is that his work is outside the ordinary. It expresses and explores beyond the limits of the everyday. As Wright suggests, there is a principle that gave form to his work, which emerged through the cognitive lenses through which he viewed, constructed, and consolidated his idea of his art. Enhancement, growth, or development came about through a convergence of three major influences: his mother, his exposures to the Froebel toys and method, and his apprenticeship to the architect Louis Sullivan (McCarter, 1997). The Froebel method of instruction can be viewed as the connecting factor between the other two, giving a coherence and substance that supported his art and philosophy. This progression of interacting factors shaped Wright's principle.

In the case of Education, levels of ambiguity interfere with a ready understanding of the educative principle. When the word *education* (upper or lower case) is used, three ideas are commonly evoked. A fourth, although less commonly connected to Education, can be identified (Cremin, 1988). To visualize the totality of how I view the variety of responses to the word, I use a tetrahedron as my mental model. Each of the four faces of this pyramid represents one of the ideas that are evoked through the word. This model concretely demonstrates that only one facet can be wholly observed at a time.

To try to fully see any of the other sides, the whole pyramid must be completely turned. Otherwise, the depiction of any one side is distorted. Evoking the word *education* creates the first level of ambiguity—its own.

One idea—one side of my mental model, *school*—can be described in terms of a Platonic ideal or abstraction of something concrete. This *school-education* might take on an individual mental image as a local building or as a classroom that one has experienced. The reported public response to this image, on the whole, is positive. The feeling is that *school-education* may need upgrading, but not major reform. A second idea of education, *system*, is also an ideal, but it is more abstract. It does not and cannot evoke an accessible mental image because it is not experienced directly. Reformers and politicians have shaped and imposed a negative public reaction to *system-education*. The third common idea that is evoked is that of economics. The image *economic-education* invokes depends on the listener. To the public, it is taxes. To the politician, it is the power of governance, and as such is the hidden drive behind the accountability movement that is part of their populist rhetoric. To the judiciary it does not exist, or if it is grudgingly acknowledged it is declared irrelevant to the law (Howard, 1994).

The fourth idea called up by the word education can be identified as the *milieu* in which education occurs. This facet in my model is the one that most reformers and critics declare off limits to dialog in education (e.g. Ravitch, 2000). They would say that this is the part of education where the hidden curriculum resides and cannot be addressed. Most teachers recognize it as the *real world*.

Unlike the unambiguous bipolar response to Wright's genius, the public can (and often does) hold two opposing views of Education simultaneously. This paradox is an outcome of overlapping surface interpretations that are caused by the ambiguities of the word, even when it occurs in a defined context. School is viewed as part of the system, and system is understood to be part of school. In like manner system and economics become confused. The nature of *milieu-education* has altered dramatically since 1993 with the accessibility of the Internet through the World Wide Web and *school-education* is merging with it, adding a new source of ambiguity.

Ambiguity can also be found within the profession through *cognitive illusions*. As with its sensory cousin, the optical illusion, humans are subject to distortions of reality at the cognitive level (Tversky and Kahneman, 1982). These distortions are like the social biases that come about through an imperfect understanding of experience or information resulting in racial, gender, and ethnic stereotypes. In system-education, such an illusion becomes part of the belief base and is passed on as reality to the public and to the members of education's sub-culture.

One such illusion is derived from industry's experience with *scientific management* (Kanigel, 1997). That theory emphasizes control of every phase of a process (manufacturing, learning) through laws and principles that define the administration, skill level, and methodology of the process. The purpose was to increase productivity by deskilling the assembly line worker. When applied to education, the tools for deskilling teachers resulted in detailed teacher's manuals and lesson plans (Apple, 1993). The sad impact of undermining teacher initiative that resulted from the wholesale acceptance of this industrial model is demonstrated by the drive and need to raise teacher training standards and teacher qualifications that we read about in the press. Neutering generations of teachers using the cloak of science served the economic goal of democratization in an industrial era that viewed individualism outside the capitalist mold as suspect. The hidden price of the frugality employed to gain that goal is just surfacing.

A second cognitive illusion has its genesis in the belief that all things can be measured. Recent technological advances allow us to observe brain activity, but we are not yet able to observe the nature and quality of intelligence or thought (Churchland, 1996). In spite of all the evidence that IQ cannot be identified numerically, a number from a standardized test is treated as if it had reality or relevance (Gould, 1981/1996). In like manner, students are submitted to the impossibility of demonstrating proficiency or competency in a standardized test format.

A third illusion, like scientific management, rises from the perception that valid theories drawn from business or science can be applied directly to the classroom. Hence teachers are subjected to faddish movements that interrupt the natural evolution of the educative principle. Quality Management theory and left-brain/right-brain theory are interpreted as solutions to real (and sometimes imagined) problems in schools. Jargon appears in the literature reflecting a blind grasping at the latest buzzword. For example, much can be learned about group dynamics and motivation from Peter Senge (1990) in *The Fifth Discipline*. It would be a mistake to build a classroom dynamic on his findings. Not because he is wrong (far from it), but because his conclusions are based on adult experiences and, if at all applicable to children, can be used in only a limited way. Using his thinking does make sense in organizational motivation for schools (school board members and administrators and teachers and support staff). Applying the terminology and theory to the classroom can only create an uncertain relationship between teacher and student and blur or blunt the learning process.

The politician's promise to run the school district like a business implies that the educative principle and the business principle are identical. The effect of hiring and firing practices that follow this reasoning has been one of the

contributing factors to the anti-intellectual nature of the school that we are experiencing. They advance the undermining of curricular goals. The common practice has been to hire a teacher candidate who can coach over a candidate who is more academically qualified. Listening to the speeches of superintendents, principals, and professors in schools of education who have been beneficiaries of this practice, one hears sports metaphors to the exclusion of richer cultural analogies that mythology, literature, and science offer. Another common practice is to *downsize* by firing teachers of *frills* such as art or music and increase the class size of the teachers who remain. When the frills are gone, the leaner movement culls from the essential subjects (math, reading) to the point where *teaching* becomes synonymous with baby-sitting.

A fourth cognitive illusion centers on those who seek to *reform* education. While their motivation is usually well intended, the reformer(s) assume(s) that there is some kind of central control that can execute reform. The illusion of control rises from the hierarchic structures within buildings, districts, counties, and states. One contributing and major factor supporting this perception is that the curriculum has structure or form. For example, it is true that, generally, there is a formal, county level document that defines what will be taught and when it will be taught. In broad terms this may be a true representation of curricular activity. However, the classroom teacher has the ultimate control over curriculum (Tyack & Cubin, 1995), and the educative principle is evidenced through that teacher.

As pointed out above, the educative principle is part of an adaptive system and one manifestation of that system is self-organization. Self-organization excludes the idea of someone or something in charge. The usual models of self-organization come from nature. Insects—bees, ants—display cooperative and diversified behaviors without leadership. A flock of birds will gracefully swoop, swerve and land in a coordinated fashion without a coordinator (Resnick, 1994). Whenever the focus of the system is interrupted, the system destabilizes and erratic survival behavior occurs. The focus of the educative principle has been brought to the edge of such a destabilization through legislation. Standardization of curriculum in the guise of *accountability*, and mandating classroom technology have been imposed by ukase. While how that plays out over time is uncertain, in the near future the system will react.

New dynamics are coming into play in response to an explosion of technology. These reactions are branching or will branch in three directions. The first, the Internet, is a function of the library in or out of the classroom. It focuses on the Internet as a tool for research or as a supplement to the curriculum. If it is not already in place in a particular school, it is well on the way to ubiquity because of the rush by state and federal mandates to bring the computer to the classroom. A second product of technology that effects schools adds to the ambiguity in our understanding of education. In the earlier discussion, I point out that one ambiguity is being created by the intersection of school-education and milieu-education—between the classroom or the district and the real world or the information culture. That ambiguity is directly related to the structural changes that are being made in system-education—charter schools or, in this case, electronic schools (e-schools). The e-school is technology applied to the charter school concept. This change is more than having the student understand the uses of the Internet as a research tool. It is a major shift in the delivery system that would substitute the Internet for the classroom—Internet Home Schooling.

The idea of conducting classes over the Internet began at the university level. Since this is an economically successful adjunct to higher education, it serves as a ready model for application to the delivery of the K-12 curriculum. Instructional strategies, developed during the experience with programmed learning and Skinner machines that began in the thirties (Lumsdaine & Glaser, 1960), blend seamlessly with the new technology. Electronic flashcard and multiple choice question-answer formats are proven methods of studying *for the test* and will work in this environment. The delivery system can be tailored to fit tightly to the state proficiency standards. It will be uniform in a way that the traditional school cannot emulate, given the individual styles of multiple teachers. If implemented as promised, summary data will clearly demonstrate this. The legislator's goal will be met—higher test scores on state report cards. Unfortunately, multilevel learning—part of the vision in the educative principle—is sacrificed.

Extrapolating from the pros and cons found in some of the Artificial Intelligence (AI) and Robotics literature (Dennett, 1998; Moravec, 1999; Kurzweil, 1999), a third technologically induced innovation has yet to move from the laboratory but it seems close to doing so. The Teaching Android (troid?) is a logical direction that will take the form of a sophisticated teaching machine for drill-and-practice and low level cognitive skills, incorporating advances from AI and Robotics. The troid will not need the kind of locomotion associated with the common image of a robot, but it will have a vocabulary of at least 60,000 words, recognize and respond to faces and facial expressions, and interactively teach and test fact-based lessons. As it interacts with each student, it will read and learn individual body and vocal nuances, and tailor each lesson to the individual's learning style or talent.

For the average educator, the immediate reaction to the paragraph above will be one of rejection. Robots are science fiction. Machines do not have the kind of *intelligence* that is described above. However, most of the speech and face

recognition is in place commercially at this time. Familiarity with simulation games (Pesce, 2000) should resonate with my description of interactive fact-based learning environments. I will admit that, at the moment, machines may not have the ability to read nuance and the first robots will not be quite as sophisticated as I am suggesting. Believing that such advances are impossible is wishful thinking. Not anticipating dramatic technological change will result in a scramble for readjustment that will be more profound than current attempts at coping with the Internet by teachers. Technology is moving so fast that the old technology—computers and fiber optic networks for today's wired classrooms—is obsolete before installation. In the past, when it could take almost twenty years for the overhead projector to travel from the bowling alley to the classroom, there was time to adjust—to develop strategies. Today, there is no time buffer.

The troid will not pass the Turing test for artificial intelligence (e.g. Kurzweil, 1999), but to the teachers and students that will interact with it, it will seem sentient. That illusion of consciousness and life suggests profound practical and ethical implications to which the educative principle must adapt. It will be necessary to re-evaluate the curriculum (e.g. add speech as a subject in the elementary) and to establish safeguards to protect students from Orwellian brain washing. Though these are profound enough, they are surface level and obvious. To respond coherently, it will be necessary to achieve a practical understanding about the role and structure of the curriculum. To be effective, that understanding must be in synchronization with the knowledge base about learning that has developed rapidly within the past few years. Complicating that imperative is the realization that the knowledge base itself is not static.

The pioneer genius is often found in *error*. Many visitors to *Fallingwater*, the Kaufman home near Pittsburgh, observe that Wright's spatial allocation for the bedrooms is inadequate. Some reformers in education (e.g. Hirsch Jr., 1996) fault Rousseau for being an out-of-touch Romantic whose ideas have destroyed education. In the literature Piaget is challenged by Vygotsky (1934/1962); Piaget and Cholmsky challenge each other (Piatelli-Palmarini, 1980). In the end, however, theorists end up with a few basic facts that teachers from the time of Plato (1968) intuit through experience. Children learn progressively in a process that is usually described with construction or building metaphors. Learning passes through stages that cannot be bypassed. And the ultimate conclusion: A child is not an adult. These intuitions are universal within the educative principle. Attempts to subvert any of this basic reality are corrosive.

The idealist who would re-form the educative principle is like the geneticist who removes *defects* from a plant through DNA manipulation. The resulting plant looks like nature's original but is usually sterile and the manipulation must be performed continuously. The educative principle is like a natural seed. It is characterized as emergent—a complex adaptive system. However, it is found in an interfering context of ambiguity in Education as an institution and as a profession. Left on its own, the educative principle will adjust to that tension if given time. Those who view education as having static standardized limits stunt the natural process by politically mandating curricular and technological changes. In doing so they undermine their own goals, reinforce an anti-intellectual bias, and exacerbate the impact of technological change.

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