

NANO-TECH: COMING TO CHANGE YOUR LIFE

REAL ESTATE REALISM • JAPAN'S BABE RUTH

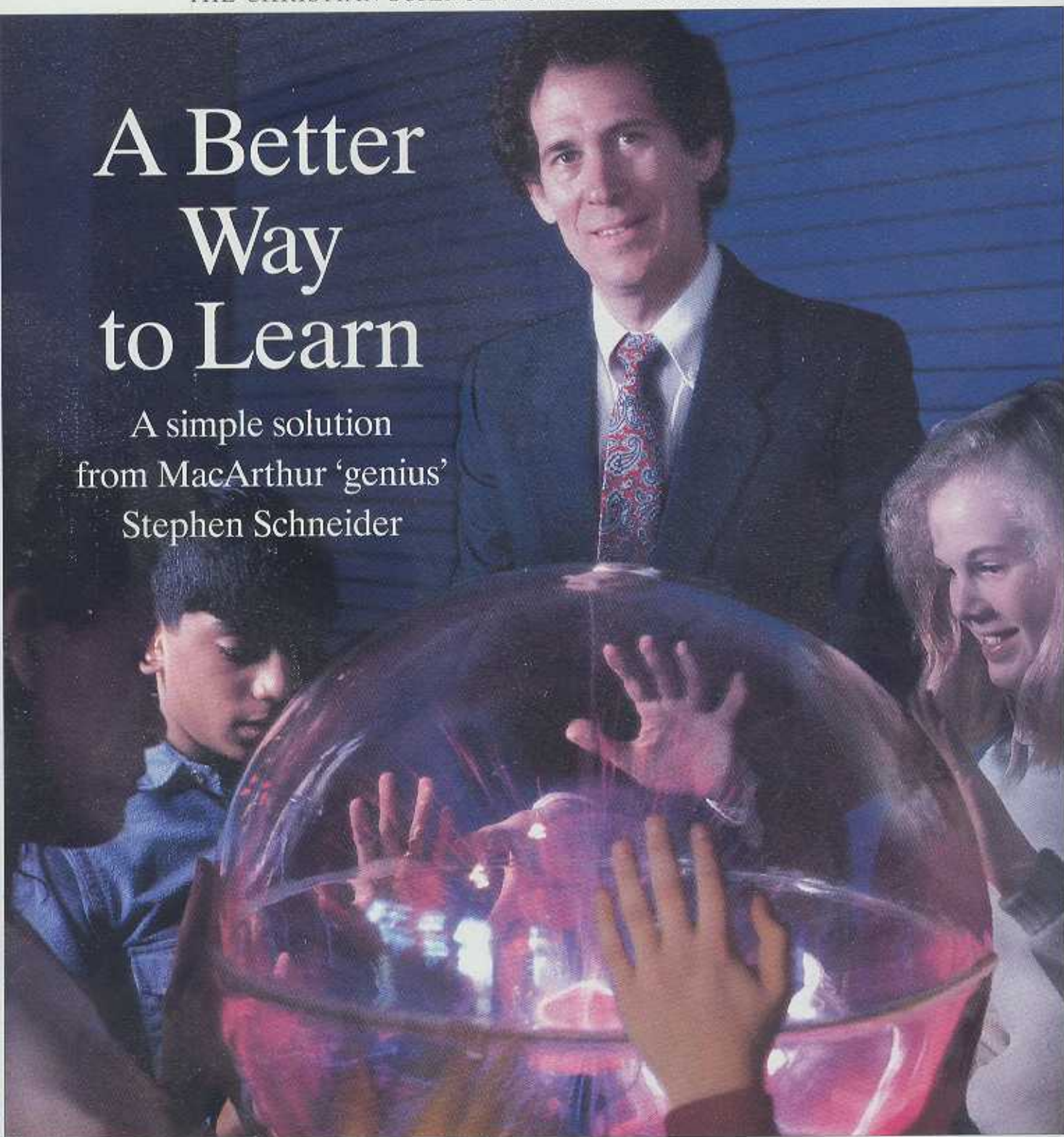
KEITH JARRETT OFF THE RECORD • BUSHMEN ON THE BRINK

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A Better Way to Learn

A simple solution
from MacArthur 'genius'
Stephen Schneider



A BETTER WAY TO LEARN

George Bush called himself the “education president.” Bill Clinton has put “education for competitiveness” near the top of his priority list. The US Congress resonates whenever better schools are mentioned.

But the sad fact is that America has rededicated itself to improved education in every decade since World War II. And still the results don’t measure up.

Can it be that American education is like the old line about the weather: Everybody talks about it, but nobody does anything about it?

In the interest of stimulating some doing, let me take you on a tour of some schools—and then put forward a modest but, I hope, extremely useful proposal, one involving only 10% of daily classroom time.

First the disclosure clause. I’m not an educator. (In fact, contrary to the old line, my career involves trying to do something about the weather and climate.)

But I am a parent. I’ve served as chairman of a mid-American school-improvement team. And

I’m using a MacArthur Fellowship in part to study how science can be better taught. And that means going into school classrooms and finding what catch-

Just 10% of classroom time can unlock children’s creative thinking. A parent, physicist, and MacArthur ‘genius’ tells how.

BY STEPHEN H. SCHNEIDER

es students' attention. Let me give you an example of what I mean. I have two kids, 11 and 13, and I have frequently visited their schools to talk with their classes. I went to their elementary school a few years ago, just after I'd been on a PBS program that discussed global warming. The ages of the kids I faced probably ranged from 8 to 12.

Now I should tell you that in a school situation I try to stuff my instinct to lecture like an expert. Instead, I like to

conduct dialogues with the kids. Sure, they can give you a lot of "wrong" answers. But if you lead them through a dialogue, helping them to shape their own ideas and experiences—in other words, helping to empower them to think for themselves and have the courage to express it—they usually do amazingly well. I've learned what every good teacher already knows: Nine-year-olds really have no hesitation about telling you what they think if you free them of the stigma of having to be "right."

Anyway, we got a kind of Socratic dialogue going in that school that day. We started out talking about how climate works—why it is warmer in Kansas than in San Francisco in July, and just the opposite in January. They already knew the reason was being near or far from the ocean, and with a little help they even figured out why. Soon I asked them what was one of the biggest polluters of the atmosphere. "Coal," they replied, having seen the PBS program.

"OK," I said. "What should we do about that?"

"Well, I guess we better not use it," one kid replied. Fine. Nobody disagreed. So we went on to some other subjects.

But a few minutes later I came back to coal. "Where does coal come from?" I asked.

They started with dinosaurs, and, with a little shaping from me, worked their way back to prehistoric plants. But I told them



I was not so much interested in where coal came from 100 million years ago. I wanted to know where it comes from today, and how we get it to power plants.

They knew—or easily guessed—that it is transported by trains and trucks, and gradually we got to the person who digs the coal out of the ground.

"Why does that person dig it up?" I asked. "Does that miner like going down in dark holes, or something?"

And the answer was, "No, of course not, but a miner needs money."

"Why?"

They laughed at my naiveté. "To eat, go to the movies, buy clothes and Nintendos for the kids."

So I said, "Well, what happens if we do what you guys said we ought to do? What happens if we stop using coal?"

All of a sudden the room was silent. For a long minute. They realized they had just unwittingly doomed some coal miner's kids to poverty.

"Maybe we can't ban coal," one kid said. "But what about the birds and fish if we don't?" another chimed in.

Finally one 11-year-old said, "Well, maybe we could find something else for miners to do."

"And maybe we could lower the age for serving in the US Senate," I joked, trying to conceal my goosebumps. "Because they haven't figured that out yet!"

As we continued to talk about this issue, we explored the alternatives to coal—and to unemployment. But the best part of the discussion, to me, was that it took place in a realm that I like to think of as the realm of creative thinking—as opposed to rote, programmed learning.

I should add that I have tried this same exercise at the junior and senior high levels and at the university level, with freshmen and sophomores. And you know what happens there? Nothing. They look at one another or take notes. It is tough to get creative responses.

But creative responses are essential to teaching topics that are global, long-term, multidisciplinary, and cross-cutting. How do we teach about real problems—of peace, environment, produc-

tivity—when we tend to learn in boxes and organize ourselves in industry, government, and education into disciplinary niches—in departments of economics, chemistry, and biology? I think one answer can be found by changing the way we approach primary and secondary education in only 10% of daily classroom time.

Once I told some non-forthcoming college honors freshmen about what goes on in the elementary schools I visit, and I asked them, "What happens between the ages of 9 and 19 to kill your brains?"

"Junior high school," one nervous student mumbled out loud. The rest of the kids erupted like a geyser. And I heard virtually the same thing from all of them—that their classroom silence begins in junior high school.

Since then I've had other students confirm that they were afraid to speak up in junior high because their friends would think they were trying to show off. And there have been those who've said they were afraid of getting tagged as dumb.

College students also consistently tell me that their high school teachers rarely encouraged them to speak up creatively. They say teachers overwhelmingly wanted them to "learn" what was in the syllabus and the standardized tests, and not to question the curriculum or go off in directions that the teachers didn't know much about.

"Tell me about the good teachers you had in junior high and high school," I suggested. And then these same college students overflowed with enthusiasm.

I can remember the freshman who told me about a high school history teacher who'd set up the students to role-play different countries in famous conflict situations. And there was a math teacher who had asked the kids to invent examples from their lives to use in applying particular mathematical methods. Time after time, it seems that the teachers they truly learned from were the ones who empowered students to have the courage to be creative and to express their opinions in class—right or wrong could be sorted out later.

HUMAN COGS

Creativity isn't simply learning the textbook. It is finding new ways to think or act. So, one problem that we have today in education, in my opinion, begins between the ages of 9 and 19. And the problem is the impression that "truth comes only from the front of the room," rather than from within individuals and by research, questioning, and group discussion.

Now, I know that every teacher has a curriculum and a syllabus to follow, and I know that time is limited, and that teach-

ers sometimes have as many as 30 kids in a single classroom. And I don't oppose texts, tests, or achievement standards. And we all know that creativity is not measured by grades alone.

I think the problem is more gut level: that the US education system overall is set up to package information and to process people to be plastic cogs in the economic engine. And the vaunted Japanese system? It makes *titanium* parts for its economic juggernaut.

I'm reminded of a trip I took to Tokyo several years ago for an international industrial congress. As it happened, I was the featured environment speaker, and my Japanese hosts very graciously invited me to dinner one evening. It was a spectacular sushi meal, and as we talked about the day's events and dined sumptuously, we began to relax and to genuinely feel like trusted friends.

I could tell that the environmental official who was sitting beside me had something on his mind. Finally he loosened his tie a bit, leaned over, and said, "I've got to ask you a question."

"Fine."

"I don't mean to be insulting," he began, "but everyone agrees that the American public education system is poor, and that our workers are better trained in technical skills and better disciplined in their work habits than your workers. So why is it that we can *build* better products than you can, but we can't *invent* them?"

"Let me ask you a question," I replied. "Think back to your own school days. Can you remember a time when a teacher said something that you *knew*, from your own reading and study, was wrong? What did

you do? Did you raise your hand, or ask for clarification?"

"Never!" he answered, visibly agitated. "That would have been inconceivable."

"Well," I said, "what you're asking me about goes to the heart of how you define creativity. What do you think it is? It's being different, isn't it? It has to do with not being afraid to ask questions, and not being afraid to take risks."

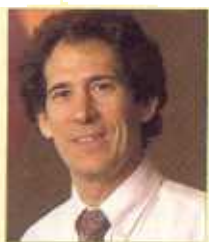
"Very difficult," he said, glumly. "It would be very difficult in this culture to teach people to do such things, especially things that appear to insult seniority."

More than ever, what we need in the US is a system that encourages kids to ask questions.

Remembering my Japanese friend's comments makes me realize more than ever that what we need in the United States is a system that encourages kids (and adults, too!) to ask questions—especially about whether they want to be turned into machine parts! Somehow we have to get kids participating creatively in the process of their education. Because if they continue to think that truth comes only from the front of the room, and that learning is a product that can be standardized, we are going to end

up with sheeplike, uninformed citizens who are not capable of conducting public debate on difficult issues. And that will leave the "solutions" to the spin doctors, advertisers, elites, and lobbyists.

I can't help but remember a well-known British scientist-statesman who had the knack for getting right to the heart of an issue, and knowing exactly what questions to ask. I first met him when I was invited to a conference on nuclear winter in 1985 in Bellagio, Italy. The participants were



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He frequently lectures on college campuses and says he "talks with elementary and secondary-school students, right on down to Congressional committees."

divided between applied-physics types like me and theologians. There we were, in an incredibly beautiful, opulent setting, discussing gigadeaths and the fate of Earth.

One of the most remarkable panelists was Lord Zuckerman, a former chief scientific adviser to the British secretary of state for defense. He told a story about his early days in the Defense Ministry:

An admiral and a general came to him to discuss the details of three alternative designs for nuclear warheads. They

had launched into an involved presentation when he brought them up short.

"Excuse me one moment, gentlemen," he said, "but what's it for? What's its strategic purpose? And how can we decide on the best design until we understand what it's for?"

I'm suggesting that we're never going to begin to solve any of the problems that I mentioned above—problems that are global, long-term, and multidisciplinary—until we ask the same question about our

public education system: "What's it for?"

Should it be designed only to create tens of millions of stratified careerists for a system where only the elite are allowed to be creative? Or should it be designed to foster creativity wherever it's found?

10% = Q & A

Each of us has some component of creativity. I think that creativity is partly innate—and partly teachable. We may have

different endowments as to how far we can go with our creative bents. But I'm quite certain that if those creative talents are beaten down for some individuals—as they may have been for my Japanese friend—such individuals will never have the same degree of inventiveness as those who are encouraged to challenge the system, and to do the hard, disciplined work of proving their challenges.

I'd therefore like to propose a "creativity tithe": that 10% of classroom time be devoted to encouraging individual initiative and creativity. Creative dialoguing is one way to get kids involved again in the education process. I'd like to propose that the education process be reinvigorated by rewarding teachers who aren't afraid to risk letting kids say what they think, and who aren't afraid to say that they don't have all the answers. I can't think of anything holding more promise for the future than a teacher who, in a dialogue with kids, is willing to say to a student, "I don't know the answer to your question, but how do you think we might find it together?"

I'm convinced that this kind of empowerment to ask questions and this process of learning how to learn will last a lifetime. Whereas the facts that are learned off a syllabus may not linger past the final exam.

EXTRA CREDIT

Now I'm not suggesting a return to something akin to the 1960s Berkeley free speech movement for fourth-graders. The idea isn't to go out and tear down the education system just because it's got problems. These are well-known to have multiple causes, including disparities in students' social and economic status.

What I *am* suggesting is that students of all status groups should be encouraged to challenge their teachers' premises—provided they take the next step, which is to back up their arguments with evidence, with logic, and with carefully reasoned suggestions even if these have to be labeled as speculative. And they should get extra credit, not censure, for such creative, thoughtful troublemaking.

I'd also like to propose that competition in the classroom or on the scholastic playing fields be mixed with some compassion. I'm not against competition, except that in many cases it insists on winner-take-all and loser-go-home. And somehow we have to teach kids (by example, perhaps?) that winning also has an obligation—to recognize how the loser feels. And to remember that winners are sometimes going to be losers.

Not everybody is going to like the idea of shifting 10% of class time from work on testable standard curriculum to more subjective "creativity training." I'm not remotely suggesting that I have worked out all the kinks. But let me offer replies to four of the concerns I have heard.

1. *Some parents want every available second in class used to improve students' grades and test scores in order to get them early-decision admissions to elite colleges.*

Such parents may be asking their children to carry out the parents' failed fantasies—a burden that some psychologists believe can reduce a child's ultimate adjustment to school and life. It has earned such guardians the unflattering label of "cannibal parents"—they devour their children's sense of self-determination. Psychological theory aside, the great achievements of creative people are not generally made by those who can best give back the canned curriculum, but rather by those free enough intellectually to find new ways to do things. Good grades or SAT scores are fine, but are just not enough to predict creativity.

2. *If we encourage kids to question the curriculum or the purpose of school, they soon might doubt authority in general; for example, their parents, priests, or president.*

In my value system it is the unthinking followers and the don't-make-waves types who keep some of our industrial and government agencies in neutral. The most successful, innovative companies (i.e., high-tech firms) reward creativity, helping to maintain America's competitive edge. Disciplined and rewarded iconoclasm is less likely to produce mediocrity or riot than suppression of open debate, of individuality, or of questioning standard practices.

3. *Creative learning is hard to evaluate, and thus both student and teacher performance evaluations would become more subjective.*

Several years ago I was chairman of my kids' elementary school's "School Improvement Team"—a state-mandated committee of parents, teachers, community members, and the principal. The SIT's mission was to evaluate the school's

performance in meeting educational goals set by the board and legislature. These included, rhetorically at least, both achievement and creativity. But virtually nothing existed to measure creativity. So, ignorant of any professional educational research that might have been under way, we met monthly for a year and a half to see what we could fathom for ourselves.

First, with the active participation of Betsy Krill, the principal, we came up with a motto for the educational goal of the Mapleton Elementary School in Boulder, Colorado: "Shaping Education From Within." We felt that some of the best

judges of what excites children are parents—if they'd watch and listen to their kids and report on their observations. So we designed a questionnaire asking parents to write down what aspects of school their kids talked about at home—negatively, neutrally, or enthusiastically. Most important, did the child on his/her own continue to read, draw, write, or sing about topics from school beyond assignments?

For teachers, we suggested devising a form—parallel to traditional report

cards—on which observations about children's creative or self-motivated learning could be recorded.

Such observations would be subjective. But, by standardizing the format and tracking the responses over time, we felt we'd come up with consistent indicators of individual initiative and creative performance. (After all, even standardized tests have essay questions calling for subjective evaluation.)

Of course, for such parent/teacher measures to work, educational professionals need to take teaching and evaluating creativity seriously, devising many means to do so. This is an element of the "creativity tithe."

4. *Teachers have complained that some school boards and state legislatures are already threatening to tie teachers' pay to a "merit" system that objectively measures their performance based on how students do on standardized tests.*

If means like those above were avail-

*I can't think
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able and maintained over time, they could be used along with other measures of creativity to help provide fairer evaluation of students' and teachers' overall performance. This delicate topic requires operating experience and constant renegotiations and reappraisals among teachers, administrators, parents, legislators, and students. But first it requires the will to experiment and take some risks in putting creativity higher on our education agenda.

NOT FLAKY

I realize what I am proposing isn't easy,, given classroom sizes, school budgets, social problems, teachers' salaries, and the like. But I think that without this kind of fundamental change—from *product* and *facts* to a creative, questioning learning *process*—it will be very tough for schools to turn children into adults who can understand global, long-term problems, let alone feel competent to solve them creatively.

However, if we could give teachers a curriculum flexible enough to allow 10% of their classroom time each day—or even an hour or two a week at first—to encouraging, evaluating, and rewarding creative thinking, I think we could go a long way toward creating the citizenry that will be better able to diagnose and solve long-term, global problems.

Now when I say “creative,” some people may think “flaky.” And they may think that means we're not going to teach “hard facts,” or that students won't be prepared to compete in the working world. But creativity means finding novel ways to solve problems—which means learning equally about products *and* process. If we can only get more teachers, parents, and administrators talking about this issue, it will become possible to take a small step or two, and over time a more comprehensive approach will evolve.

I'm not a flaming revolutionary. I don't argue that we have to can the traditional curriculum by next week. But I do think that we can't continue with “business as usual” in our schools—or political debates—for much longer. People have to feel competent to deal as citizens with perplexing, long-term, global, and multidisciplinary problems. We have to make an effort to change our system, 10% by 10%. And before long, what might be thought radical today can become common sense tomorrow. And, like other “unthinkable” achievements, such as the crumbling of the Iron Curtain, it can happen within a single generation. WM