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ABSTRACT

This article considers the role of the basic cognitive unit, called the "story engram," in young children's learning to read, including children ranging in ability from severe mental retardation to giftedness. It illustrates how the "Ball-Stick-Bird" method of beginning reading can facilitate this process because of the method's simplification of the mechanics of letter recognition and immediate story immersion. The method's early lessons begin by telling a story primarily with nouns and verbs, then add adjectives and adverbs, and finally include articles and prepositions, thus mimicking the language learning process. Traditional measures of intelligence are contrasted with the ability of humans to impose cognitive structure by utilizing story engrams, a skill that can be taught. The resulting greater intellectual equality, in which knowledge and intelligence quotient need not be correlated, is thought to have potential for leading people out of the information age and into the knowledge and sharing age. (DB)

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The Assayer's Scale

Was Intelligence the Ultimate Currency of the Information Age?

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BY RENEE FULLER, Ph.D.

We got a tantalizing taste of the work of Dr. Renee Fuller in WER #64 (p. 126) and wanted more. As a practicing physiological psychologist, she discovered that people act as if their brains are built to organize information not in bits, but in terms of "stories" — someone or something acting or being acted upon. She calls the basic cognitive unit the "story engram."

Story engrams incorporate and organize many bits, giving them a context that facilitates recall. Fuller has found that people learn to read, write, and organize their thoughts much more easily by means of engrams than by the usual methods of learning alphabet, words, and sounds without context. Because her methods are attuned to the way we naturally use our minds, just about anyone can learn to read, including many considered to be hopelessly unable. Her discoveries have important implications for all teaching and learning.
—J. Baldwin

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PETER WAS ONLY SEVEN when he swaggered into my office like a pint-sized Texas billionaire. Even without asking I knew the reason for the swagger. His parents had told me — Peter had tested in the genius range on the IQ test his school had requested. And Peter had understood the meaning of his high IQ score. He was in possession of the ultimate property of our information age, a high IQ.

We humans have always liked to own things. Possessions give us importance, status and identity. During feudal times, land had become so defining a possession that even a person's name was frequently linked to it. Then, with industrialization, there occurred the first of three major shifts as capital, also known by the more mundane name of money, became the property that conferred importance, status and identity. Continued advances in industrialization were led, at the end of the last century, by knowledge-information applications; the definitive possession, which had shifted from land to money, shifted once again — this time from money to knowledge-information. Status, importance, and identity began to be defined by information expertise. The knowledge-information purveyors became the important people of this new society. But contrary to land and money — which, being tangible possessions, are easily quantified — how was knowledge-information to be quantified?

The answer was: test for it. Enter the various mental tests, including the IQ test. But the IQ test developed into something more than a measure of how much a person knows. It became a predictive test, attempting to determine how much knowledge-information a person is capable of acquiring in the future. The test, with its intelligence quotient (IQ), created a concept new to this century, one that reflects the reality that knowledge-information has become the defining property. Now, during elementary school, many of our children are given some form of IQ test. And as Peter had understood, a high score implies that the owner is in potentially ample possession of the ultimate property. He/she is a potential purveyor of information. The admiration and envy with which we treat such people are similar to the treat-

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ment accorded the moneyed rich of the industrial age, and the landholders during feudal times.

There is, however, a major difference that makes intelligence the ultimate property. While the loss of land during feudal times, or money during the industrial age, meant the loss of importance, status, and identity, it did not mean you had stopped being "you." But with the loss of knowledge-information, and/or the capacity to acquire it, you cease to be the same person. The capacity to think, and acquire knowledge-information — being located inside us — has an intimacy that surpasses all other possessions. Since IQ tests are the presumed evaluators of this property, they have a high emotional charge. When there are questions about the validity or reliability of IQ tests, emotions run high.

During the fifteen years that my research had required intellectual evaluations of my fellow humans, I had seen firsthand that the tests, when properly administered, are surprisingly good predictors of what a person is able to learn, what information can be acquired, even the thoughts he/she is capable of thinking. IQ tests predicted much more than school performance. They were truly the instruments to measure the defining property, or potential property, of the information age. Was there some satisfaction because I considered myself the proud owner of considerable knowledge-information property? Of course. It's fun to be rich: to have status, importance, and identity.

Which is why, when some of my staff reported successes that should have been impossible for low-IQ students, I did not believe them. How could I possibly believe that they had succeeded in teaching reading with comprehension to severely retarded students? Such results run counter to what the IQ tests measure. Besides, the reading program had been designed for learning-disabled adolescents of superior intelligence. Surely my staff, in their eagerness to have even the severely retarded succeed, had seen things that weren't there.

There is an inevitability about the way the human brain forms story engrams that explains not only the universality of grammar, but also the speed with which children normally learn language.

But they were there. And they kept being there, again and again.

It was not only that severely retarded students, and normal four-year-olds, easily learned to read advanced text with comprehension — their significantly increased capacity for knowledge acquisition and their mature language content did not fit modern concepts of intelligence and IQ. Abstract ideas were supposed to be out of reach of the severely retarded and the very young. Such intellectual property belongs to higher mental ages, to higher IQ levels.

We spent the next five years expanding the original study, trying to understand what had happened and why. Instead of providing answers, the results became more and more confounding. The IQ tests that had been such useful tools in my previous research had not only lost their predictive value; they were not even descriptive of what our students were doing in the present. As a good scientist, I turned the question around and asked, "Is there anyone who fails with this program?" We eventually found two. The two failures, however, were not our lowest-IQ students — quite to the contrary. But they had in common something that turned out to be very rare even among the severely retarded. They were unable to follow a story. Both of these students had almost continuous petit mal seizures. My suspicion was that the repeated electrical discharges prevented long-term memory traces from being established; hence their lack of story organization and story recall. Since story context is an essential component of the reading program, this would explain the two failures.

In the Ball-Stick-Bird program, story reading begins with the presentation of the fourth letter.* This immediate story immersion makes what I call "code approximation" possible. In code approximation, the inability to achieve fine sound discriminations is used to the advantage of the learning process. Instead of being taught multiple phonic sounds for each letter, which must then be discriminated, the student is given the most usual sound. And he/she is told the truth:

* Ball-Stick-Bird simplifies the mechanics of reading by showing how each letter of the alphabet can be made with three basic forms — a circle (ball), a line (stick), and an angle (bird). It also emphasizes the abstract process of comprehension. Word-building begins with the presentation of the second letter. By the time the student knows four letters he is reading stories.

We had trouble accepting that it was now possible to communicate intellectually with those who had been labeled as severely retarded or culturally deprived.

that the letters represent a sloppy code requiring a flexible approach. This flexible approach to letter sounds is introduced with: "You are a detective. The letters are your clues. But like all clues you can't be sure of them — until they make a word that makes sense in the story." In the first lesson, the student already uses "code approximation" to decipher the story.

Immediate story immersion also makes possible the innovative use of developmental linguistics and story-engram layout [see sidebar]. The first two books begin by telling the story primarily with nouns and verbs, which form an elementary story engram. Adjectives, then adverbs, enrich the story engrams after the first few lessons. The later appearance of articles and prepositions continues the sequence; this resembles the progression through which children learn language (developmental linguistics). Each story engram (tabloid headlines or political sound bites are good examples of story engrams) appears on a separate line. In this way, the layout shows how the bigger story is built, line by story-engram line. The two innovations — developmental linguistics and story-engram layout — were introduced to make story comprehension easier, so that contextual cues could be used in code approximation. They were not supposed to actually teach language and thinking. But that is exactly what they did.

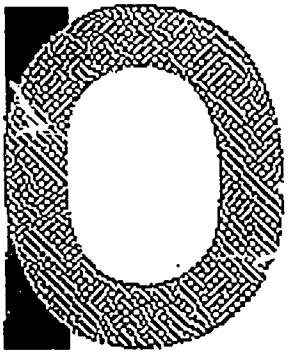
We had noticed that our students, even the severely retarded, started to write or type on their own by the end of Book 3. Using developmental linguistics, they assembled their thoughts by first searching for the noun, then the verb, gradually adding the adjectives and adverbs. That is how they built their story engrams - – the same way the books had done it. Then they gave each story engram a separate line, mimicking the story-engram layout. Asked why, one of our retarded students explained: it "help you think." Developmental linguistics inadvertently resulted in implicit learning of how an idea is built. Story-engram layout, which shows how the bigger story is built, produced further implicit learning of story and idea elaboration. Our students became living examples that thinking can be taught.

As for their IQ scores, these bore little relation either to their reading performance or their subsequent performance in the outside world. In retrospect, this should not have been a surprise. IQ tests, following the tradition of the original Binet test, measure neither story comprehension nor story building. Instead, they measure isolated skills frequently involved in drill learning, and isolated bits of information — very different from the context-oriented approach of the reading program. IQ tests measure only one component of the knowledge-infor-

Ball-Stick-Bird Reading

Learning the alphabet is not where it starts; students learn letters by actually constructing them physically from the three simple cutout shapes Dr. Fuller calls ball, stick, and bird (a V). They're all caps so as to reduce discouraging confusion. At the same time, students are taught the most common sound of a letter and words that use it that way. Words begin as the second letter is presented; story engrams begin with the fourth. The lessons last just ten minutes or so. Dr. Fuller emphasizes that "immediate mastery is not required" because all the material is repeated over and over in different contexts.

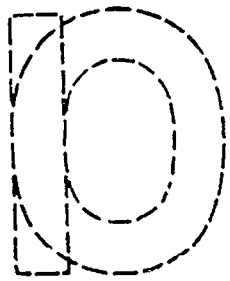
The series of Ball-Stick-Bird Reading books and their accompanying teacher's manual are available from Ball-Stick-Bird Publications, Inc., Box 592, Stony Brook, NY 11790; 516/331-9164. –J. Baldwin



Developmental linguistics inadvertently resulted in implicit learning of how an idea is built. Our students became living examples that thinking can be taught.

mation complex, a component that computers handle so well. Even a standard desktop machine, with a dictionary and encyclopedia, has an IQ that far surpasses its human creators. And yet our students with IQs as low as 20, once we had taught them to read with comprehension, exhibited a capacity for knowledge organization that far surpasses the capability of those high-IQ machines. Although it had not been intended to, the reading program teaches how to impose a cognitive structure on bits of chaotic information.

The cognitive structure that our students learned through developmental linguistics and story-engram layout has a long evolutionary history. Vervet monkeys already have distinctive sounds for different predators (nouns) that require different responses (verbs). This noun-action-verb complex is not dissimilar to the simple story engrams used in the beginnings of Books 1 and 2 of the reading program. There is an inevitability about the way the human brain forms story engrams that explains not only the universality of grammar, but also the speed with which children normally learn language. It also explains why sound bites and tabloid headlines are so effective; they tap our fundamental unit of cognitive organization. Because this story-engram structure is fundamental to all humans, stories from one language can be translated into other languages. Story organization is so basic to our thought processes that it is difficult to imagine another way of organizing information. Even the aliens in science-fiction stories usually communicate in story form. There are other ways of organizing information, as insects and computers demonstrate; but for us humans, our stories, from creation to perdition, describe a cognitive similarity that makes us one species.



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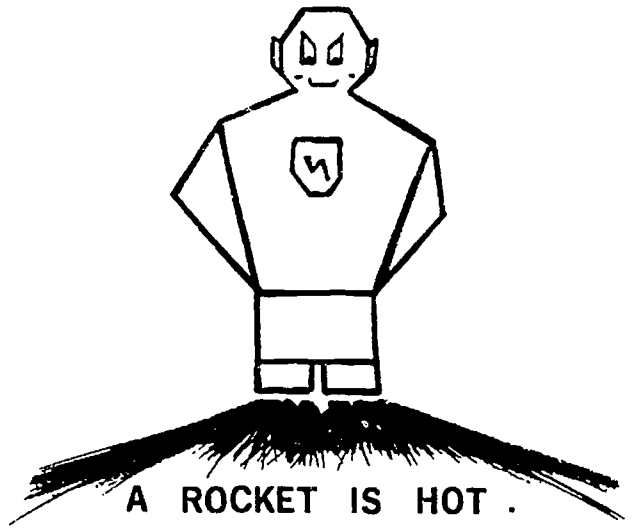
HAS ROCKETS FOR FEET .



A ROCKET IS HOT .

IT IS RED HOT .

Story engrams represent an extraordinary solution to information overload. By imposing a structure on millions, even billions, of bits of information, their rapid reintegration and retrieval becomes possible. As in the case of the vervet monkeys, there are evolutionary advantages to a cognitive structure with the capacity to draw rapid conclusions. In contrast, our high-IQ computers have dealt with information overload by indexing and categorizing, making encyclopedias of information storage possible. But the machines are incapable of the reintegration and organized retrieval of information that we inadvertently taught our lowest-IQ students.

The understanding of language, cause and effect, meaning, are human cognitive essentials that are out of reach of machines. Though they are the possessors of more information property than any mere human, because their evolutionary development did not take the story-engram form, they lack the most important component of knowledge-information property. Without stories, computers, unlike humans, cannot create meaning.

The difference between human cognition and machine cognition highlights what has happened in our time. A growing split has developed in knowledge-information property. The two components, knowledge and information, have drifted apart. The information component, once stored solely in the human brain, is now stored primarily in machines and books. The knowledge component, on the other hand — built with story engrams that structure the information from the books, the machines, the environment and the senses — continues to be the proud property of the human brain. Could we be experiencing a third major shift in what is considered the defining possession? Will status, importance and identity, rather than being defined by how much information we have stored in our brain, be determined by our ability to integrate and organize information?

Because of its evolutionary history, the human brain organizes input on the basis of context. When this organization occurs on the conscious level, and is therefore linked to language, it takes the story-engram form. Our data show that thinking with the story engram can be taught, and that knowledge and IQ need not be correlated. Since thinking can be taught, a more equal distribution of knowledge property becomes possible, and the capacity to organize information can be widely shared.

Most vehement was the reaction toward those who had been labeled "gifted." Some teachers took the program away from this group because "it puts an even greater distance between them and the rest of the kids." And yet at the suggestion that the rest of the kids could also have the program, there was hesitation. One teacher explained, "It makes them too smart."

SOMETHING STRANGE happened to those of us involved in the reading program. We had trouble accepting that it was now possible to communicate intellectually with those who had been labeled as severely retarded or culturally deprived. Of course, we wanted our students to succeed, but perhaps not quite that much. In retrospect, my reluctance to share philosophical musings with eager, disadvantaged students about the meaning of life, about how to create a better society, seems hard to comprehend.

Nor were these reactions restricted to the severely retarded, the culturally deprived, or the very young. Most vehement was the reaction toward those who had been labeled "gifted." Some teachers took the program away from this group because "it puts an even greater distance between them and the rest of the kids." And yet at the suggestion that the rest of the kids could also have the program, there was hesitation. One teacher explained, "It makes them too smart."

Gradually I realized that accepting intellectual equality is not easy. Although we were terribly proud of our students, they weren't supposed to be that clever, perhaps even to become our superiors! Greater intellectual ability can be threatening. Teachers and parents, who would literally have given the shirts off their backs to a needy stranger, suddenly lacked emotional generosity. It is not that easy to share intellectual possessions, especially when these possessions are the defining property of the information age.

But we are no longer in the infor-

mation age. We have entered the knowledge age, leaving the information age to the computers. We have been liberated without realizing the full implications of this new freedom. When we built those machines with their high IQs, we liberated ourselves from having to demand that our brains absorb disconnected, boring bits of information. Our high-IQ machines do that for us. At a keystroke they can give us back any information in their arsenal. They are capable of storing so many more disconnected facts than we can in our knowledgeable brains.

We have been freed to use our brains in ways we truly enjoy. Information, which yesterday was the defining property of our age, can now be purchased for a few hundred dollars. We are freed to use our minds to build story engrams with the disconnected facts that are stored in the machines, and to create fabulous edifices of the human mind. That is what it means to have entered the knowledge age.

Given our research findings that showed how easy it is to teach thinking with story engrams, our knowledge age could become the sharing age. It is in the nature of stories to be shared. For when we create stories it is not just to help us think, but to tell them to others. Stories bind us together as a species. Other possessions -- land, money, or information — can be hoarded and used primarily to their owner's advantage. But the raison d'être of stories is communication. They belong to all of us.

We have the chance to enter a great age of intellectual bonding, an epoch of greater human equality. It could be an age where those ungenerous feelings we had toward our successful students would be woes from a bygone time. Instead of perceiving knowledge as property to be hoarded in order to achieve status, importance, and identity, this new era would see knowledge as the shared story of mankind.