8 Compelling Reading and Problem-Solving: The Easy Way (And the Only Way) to High Levels of Language, Literacy and Life Competence.

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I propose a simple universal: the attainment of the most advanced levels of language, literacy, knowledge, and competence comes from two sources: reading and problem-solving. Both the reading and the problems to be solved are self-selected, both are limited to a fairly narrow domain, and both are of intense interest: both are "compelling."

Keywords: self-selected reading, problem-solving, incubation, intentional learning, incidental learning

IS SCHOOL GOOD FOR YOU?

Little Schooling, Career Success

There are clear examples of eminent people who had little or no schooling, but who have achieved great things. Michael Faraday, one of the greatest scientists of all time, came from a poor family, and left school before he was 13. Faraday worked for seven years as an apprentice bookbinder, which meant he had lots of access to books. His employer encouraged him to read the books around him. Faraday "read voraciously" and also attended lectures and classes on his own (Howe, 1999 p. 266). Howe speculates that Faraday's interest in science grew gradually, becoming firm when he was around 18 (p. 88).

Working as an assistant to a famous chemist, Humphrey Davy, Faraday immediately took advantage of the facilities available to him and "plunged into research of his own" (Howe, p. 102) at age 21, and published his first paper at age 25, leading to his stunning career.

Other well known cases include Thomas Edison, who dropped out of school at age eight (!!), and was taught to read by his mother. At the age of 12, he took a job as newsboy on a train that had a six-hour layover. He spent this time in the library! (Schuford, 2005).

Note that neither of these accomplished thinkers "studied" or took tests.

Instead they did self-selected reading and eventually tried to solve problems that were interesting to them.

Poor Student, Career Success

H. Ohanian (2008) notes that at the university, "Einstein was a rather erratic student, skipping many classes and barely completing the minimum work for graduation, while devoting most of his time to independent study of more advanced topics in physics" (p. 11). The same, Ohanian notes, was true of Isaac Newton: "As a student at Cambridge, Newton focused on his own research and neglected the standard curriculum, with the result that he did poorly in his final exams ..." (p. 59).

George Orwell was considered a slacker in school. One of his biographers discovered, however, that Orwell "did a lot reading, but it wasn't on the syllabus" (Crick, cited in Shuford, 2005).

Again, none of these people got much out of school, but all three did self-selected reading and engaged in intensive problem-solving in areas they were interested in.

Good Student, Career Success

Simonton (1988) informs us that Madame Curie and Robert Oppenheimer were excellent students, and, of course, went on to very successful careers. It remains to be determined if they did well despite school or whether school contributed to their success. If the former, a reasonable hypothesis is that their own reading and research gave them the knowledge to succeed in school: School was a test that they passed. If the latter, school allowed them freedom and even helped them to pursue their own interests, which coincided with those of the faculty.

My hypothesis is that the crucial elements for success, for both literacy and cognitive development, are self-selected reading and engaging in problem-solving in an area of intense personal interest. In the following sections, I present some of the empirical evidence for this hypothesis.

HOW WE DEVELOP LITERACY

Research and theory have reached the conclusion that we develop literacy the same way we acquire language: By understanding messages, or by receiving "comprehensible input." There is abundant evidence supporting "The Reading Hypothesis," showing that reading, especially Free Voluntary Reading, is the source of our rading ability, our ability to write with an acceptable writing style, much of our vocabulary knowledge, our ability to handle complex grammatical

constructions, and much of our spelling ability (Krashen, 2004).

I have hypothezed that we reach the highest levels of literacy by going through three stages:

Hearing stories, or being read to, which increases vocabulary, knowledge of text structure (how stories are put together) and knowledge of the world. It also creates a desire to do independent reading (Brassell, 2003; Cho and Choi, 2008; Lee, Lee, and Krashen, 2013).

Self-selected narrow recreational reading: Evidence for the power of self-selected reading comes from studies of the impact of sustained silent reading, case histories, and correlational studies (Krashen, 2004; more recent studies include Lee, 2005; Sullivan and Brown 2014, Krashen and Mason 2015). This research shows that recreational reading is the source of much of our reading ability, our ability to write with an acceptable style, our ability to handle complex grammatical constructions, much of our spelling ability, and a great deal of our vocabulary knowledge.

Self-selected narrow professional reading, related directly to a problem the thinker is working on now (Bazerman, 1985).

There is no way specialized language can be acquired by deliberate study. In addition to to studies consistently demonstrating the superiority of reading, the system to be mastered is far too vast and complex to be consciously learned.

HOW WE GET SMART (COGNITIVE DEVELOPMENT)

As noted earlier, the best hypothesis is that we get smart by trying to solve problems of interest to us. In the sections below, I discuss the path good thinkers take in finding and working on the right problems for them, the great pleasure involved in following one's path, evidence that the path is the gateway to permanent cognitive development, and how good thinkers go about solving problems.

The Path: "The meaning of life is to find your gift. The purpose of life is to give it away." Picasso

The consensus is that there are three steps on the path to cognitive development and satisfaction:

1. Find your gift, your interest, your talent. It will be something you like, something you are good at, and something that helps people.
2. Develop your talent.
3. Give it away: Use your talent for the well-being of others.

In order to do this, we must specialize. We are all different, and have different talents and interests. When you discover your personal path, it is an extraordinary event for you: “The two most important days in your life are the day you are born and the day you find out why." (Mark Twain).

Many writers have realized that we can't be good at everything and shouldn't try. Rosenblatt (2001) advises young basketball players not to follow the typical advice about learning to go to their left, their weak direction: If you are always working on weak areas, you can never really get good at anything.

This famous quote has been attributed to Einstein: "Everybody is a genius. But if you judge a fish by its ability to climb a tree, it will spend its whole life believing that it is stupid."

Specialization is everywhere outside of school and is, in fact, strongly encouraged. A sports team may be made up of players who are all talented for that sport, but within the team there are clear specialities, and even young players soon learn what position they should be playing. In baseball, outfielders are not suited to be catchers, the shortstop would never consider pitching, etc.

The Pleasure of Problem-Solving: The Ultimate Seduction

Following one's life path requires perseverence and hard work, but the path itself is satisfying and often highly exciting, and becomes more so as we get closer to finding out "why we were born." Our education and work consists then not of "harrowing challenges, but rather tasks we find natural and interesting, tasks we were apparently born to perform" (Vonnegut, 1997, p. 148).

Picasso regarded work as "the ultimate seduction" (Chandler, 1984), as did many others: "In 1934 Schlick pointed out how important enjoyment is in sustaining the activity of scientists … Galileo Galilei … used to comment on the fun he was having setting up his experiments … when asked why all through his life he kept experimenting with the measurement of the speed of light, Albert Michelson ,,, is said to have answered 'It was so much fun' … Francis H.C. Crick, co-discoverer of the double helix, along with other scientists interviewed in a recent study, rated 'enjoyment of work' as the characteristic more responsible for his success – ahead of 32 other traits, such such creativity, competence and breath of knowledge" (Csikszentmihalyi, Rathunde, and Whalen, 1993, p. 8).

The Gateway

There is both informal and scientific evidence supporting the idea that problem-solving is the gateway to permanent learning. I find the informal evidence more interesting:

Informal Evidence. An example is the extensive and thorough knowledge many of us have of our local shopping malls. We know where to park, where the stores are, where the bathrooms are, and in the old days, where the telephones were.

None of this information came from study. The manager of the mall does not give shoppers a manual describing the mall, and require them to get 80% or better before they are allowed to shop. We get this knowledge by solving problems, by finding a parking place, by shopping, etc.

As Frank Smith (1988) has pointed out, the "laws of learning" were developed from studies using nonsense words. They apply only to facts and concepts that are irrelevant to us. When a fact or concept solves a problem that is of genuine interest, one exposure is enough. That's why this poem is nonsense:

Do you love me?
Or do you not?
You told me once.
But I forgot.

Chomsky (1987) noted that sports fans who call up sports radio shows typically have an extraordinary amount of factual knowledge and also display impressive powers of critical thinking. None of this came from deliberate study.

Formal Evidence: Experimental studies show that we can easily break "the intentional learning barrier."

Hyde and Jenkins (1969) presented subjects with written words that were flashed for a brief amount of time, not long enough for subjects to examine the words in detail. One group of subjects was asked to estimate the number of letters in the world (the "count" group). A second group was asked to determine if the letter "e" was in the word ("e-search"). A third group was asked to rate the words as to their "pleasantness." Hyde and Jenkins then surprised their subjects by asking them to recall as many of the words as they could. The "pleasantness" group remembered the most words, and also did just as well as a fourth group that deliberately tried to remember the words: "Incidental" learning, in this case, was shown to be just as effective as "intentional" learning or "study."

Wilson and Bransford (reported in Bransford, 1979), did a similar study but added another condition, the "desert island" condition. They asked subjects to rate how important the objects denoted by the presented words (nouns) would be on a desert island. The "desert island" subjects remembered the words better than the group that deliberately studied them.

These results are very important. THEY SHOW THAT INCIDENTAL LEARNING CAN BE MORE EFFECTIVE THAN INTENTIONAL LEARNING. In other words, Wilson and Bransford's subjects BROKE THE INTENTIONAL LEARNING BARRIER.

It is very easy to break the intentional learning barrier. Many things we do in everyday life, many problems we solve, are more interesting than the "desert island" task.

The Method: How We Solve Problems

Wallas (1926) described the stages in problem-solving:

Preparation: a period in which we "wrestle with ideas" (Elbow, 1972, p. 129) and try to clarify the nature of the problem.

Incubation, a term introduced by Wallas to describe the process by which the mind goes about solving a problem, subconsciously and automatically. Elbow (1972) refers to incubation as "cooking."

Incubation seems to happen best when we take a break from creative work. Wallas suggests that "in the case of the more difficult forms of creative thought ... it is desirable that not only that there should be an interval free from conscious thought on the particular problem concerned, but also that that interval should be so spent that nothing should interfere with the free working of the unconscious or partially unconscious processes of the mind. In those cases, the stage of incubation should include a large amount of actual mental relaxation" (p. 95).

Wallas first heard of the idea of incubation from the physicist Helmholz. In a speech delivered in 1891, Helmholz described how new thoughts came to him: After previous investigation, "in all directions ... happy ideas come unexpectedly without effort, like an inspiration ... they have never come to me when my mind was fatigued, or when I was at my working table ... They came particularly readily during the slow ascent of wooded hills on a sunny day" (p. 91).

Incubation must be preceded by preparation, the "preliminary period of conscious work which also precedes all fruitful unconscious labor" (Poincare, 1924).

Illumination is the result of incubation. It is the emergence of a solution, or a new idea. Of course, the "illumination" that is the result of incubation needs to be followed by more conscious work and perhaps more incubation: Ideas that arise as a result of incubation need to be evaluated (Smith, 1994); our new insight may not be right.

SMART PEOPLE, DEFINED

If the above is correct, it suggests that "smart people" are those who understand how cognitive development happens. They follow their own interests and specialize, they find a path they enjoy, they don't rely on deliberate study, and they give themselves time to incubate: they take breaks. It has probably occurred to the reader that school generally does not help us do any of these things.

How Smart People Read.

They Read a Lot. Many good thinkers, however they are defined, read a great deal and have read a great deal. Simonton (1988), for example, concluded that "omnivorous reading in childhood and adolescence correlates positively with ultimate adult success" (p. 111). And this reading pays off: Studies by Stanovich and colleagues confirmed that those who read more know more about literature and history (Stanovich and Cunningham, 1992), science and social studies (Stanovich and Cunningham, 1993), have more “cultural literacy” (West, Stanovich, and Mitchell, 1993) and even have more “practical knowledge” (Stanovich and Cunningham, 1993).

Selective Reading. While good thinkers read more, after a certain point it is not simply the case that the more you read, the smarter you get. Apparently, it is possible to over-read. Wallas (1926) was aware of this, noting that "industrious passive reading" may interfere with the incubation of new ideas (p. 48).

What appears to be critical is selective reading, reading what you need to read to help solve the problem you are working on now. Bazerman (1985) provides support for this idea. Bazerman examined the reading habits of top physicists, and reported that they read the professional literature a great deal. These physicists, however, only read carefully what was relevant to their interests at the time. Thus, reading is especially useful to problem-solving and cognitive development when it is relevant to a problem we are working on or that is on our minds now, when it helps us get new ideas or confirms or fails to confirm our hypotheses. When we read selectively to solve a problem, we remember what we read. When we read material that is irrelevant, we don't remember it.

Selective reading is especially valuable when trying to solve a problem during academic or specialized reading. But "recreational" reading has tremendous value as a means of developing literacy and as helping the reader discover areas of interest. It provides the competence and knowledge that makes "academic" or specialized reading comprehensible.

Fiction. It is likely that smart people value fiction. In the studies cited above

showing the value of self-selected reading, much of what subjects read was, most likely, fiction (Nell, 1988). Fiction may have benefits other than those mentioned above.

In addition to fiction helping readers develop high levels of literacy and acquire a great deal of knowledge in many different areas, fiction also develops the ability to empathize with others (Kidd and Castano, 2013) and a greater tolerance for vagueness (Djikie, Oatley, and Moldoveanu, 2013).

Writing in *Literacy Today*, college student Brandon Dixon tells us that fiction made the difference in his life, contributing not only to his knowledge of the world but also to his ethical development and understanding of other people's views (Dixon, 2015)

In an interview in the Guardian (October 28, 2015), President Obama gives fiction the credit for his understanding that "the world is complicated and full of grays ... (and that) it's possible to connect with someone else even though they're very different from you."

How Smart People Write

Smart people use strategies that are in tune with the view of problem-solving presented here.

They write about issues and problems that are important to them personally, and they allow for incubation: Much of actual writing for them is "preparation," a time to state problems clearly, and they spend a great time of time doing this, with a great deal of revison as their ideas evolve (Sommers, 1980).

They also know that "inspiration usually comes during work, rather than before it" (Madeleine d'Engle, in Brodie, 1997, p. 35). They take Stephen King's advice: don't "wait for the Muse. Your job is to make sure the muse knows where you are going to be every day from nine 'till noon or seven 'till three" (King, 2000).

But they also understand the importance of incubation, taking breaks when they need it. As Frank Smith has said, "Composition is not enhanced by grim determination" (Smith, 1994, p. 131).

DO WE NEED SCHOOL?

School has the responsibility to help students discover and develop their talents and explore their interests so they can reach their full potential. This means broadening curriculum options, rather than making them narrower (S. Ohanian, 1999, p. 4; Zhao, 2009): "I contend that, instead of insisting on more and more

standardization, we should be increasing variety, flexibility, and choice in what we offer in our schools (Noddings, 2009, p. 243).

Zhao (2009) suggests that school need not worry about current needs: things change, and what we will need decades from now is unpredictable: Rather, "what becomes highly valuable are unique talents, knowledge, and skills, the ability to adapt to changes, and creativity, all of which calls for a school culture that respects and cultivates expertise in a diversity of talents and skills and a curriculum that enables individuals to pursue their strengths" (Zhao, 2009, p. 156).

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