

# Cognitive tools that come along with literacy

## Summary

Cognitive tools	another way of putting it, is to think of cognitive tools as those things that enable our brains to do cultural work. Cognitive tools perform for us like mental prostheses.
Literacy	the set of cognitive tools available to students after they begin to become fluent in reading and writing and begin to use these skills in the ways typical in schooling.
Imagination	the ability to think of things as possible--the source of flexibility and originality in human thinking
Main idea	engaging students' imaginations is crucial to successful learning. If we want to be able routinely to engage students' imaginations in learning, we must understand the main cognitive tools they have available for learning. We must shape our lessons to fit their cognitive tools.

Some of the main cognitive tools students will possess in greater or lesser degree after they become fluently literate, typically between ages 8 and 15, approx.

The limits of reality, the extremes of experience	become of central concern to student's imaginations after they become fluently literate. This fascination with extremes, with the exotic and strange features of reality, is one common means students' imaginations use to explore the extent of the real world in which they find themselves. During these years, students learn a new conception of reality that is separate from themselves, and that is unaffected by their hopes and fears. Learning security in this alien reality requires active imaginations.
Associating with the heroic	is the tool that enables us to overcome some of the threats involved in the new sense of reality. By associating with those things or people that have heroic qualities we can gain confidence that we too can face and deal with the real world, taking on those qualities with which we associate. It gives us the ability to focus on any particular aspect of reality and see it as exaggeratedly central, as of heightened importance, as unique, strange, and exotic.
The sense of wonder	is a key tool in our initial explorations of reality. It enables us to focus on any aspect of the world around us, or the world within us, and see its particular uniqueness. We can turn this sense of wonder onto anything, recognizing the wonderful in every feature of the world around us. This tool can provide the gift that allows a person to recognize behind even the most routine and taken-for-granted things dimensions of complexities or concentrations of effort or accumulation of richness through history. The starting point of all science and all inquiries is "I wonder why . . ."
Knowledge and human meaning	is the title I am giving to the tool that enables us to see beyond the surface of any knowledge to its source in human life. Knowledge is part of living human tissue; books and libraries contain only desiccated codes. The business of education is enabling new minds to bring to new life old knowledge. All knowledge is human knowledge, and the imagination is enlivened by understanding the human emotional core of the knowledge the student is learning.
Changing the context	is a tool that enables the imagination to grasp the richer meaning of any topic. The classroom is often an emotionally sterile place; so routine that one topic after a while begins to look like another. By shifting the context in which knowledge is learned—by use of often simple devices--students' imaginations can be brought vividly to life, engaging the material much more richly.
The imaginative eye	refers to the opportunity and dangers involved in increasing fluency with literacy. The shift to literacy reflects also a shift from a dominance of the ear to the eye in gathering

information. Certain activities can facilitate this shift and also show the student how the use of the eye through literacy can give new powers. One of the most basic of these activities can be demonstrated through the making and manipulation of lists, flowcharts, diagrams, and other literate tools. The dangers concern the greater “distance” between the eye and the emotions that between the ear and the emotions.

I recognize that the kinds of sub-headings above are not the usual fare of texts designed for teachers. But this oddity isn't due to simple ignorance about the daily tasks of teaching. The topics discussed above have been brought into focus by taking the engagement of students' imaginations as a central concern. If engaging students' imaginations is held steadily to the fore as a condition of successful teaching, then the kinds of categories mentioned above, even if unfamiliar and perhaps seeming a bit odd, represent the kinds of things to which we should attend. If we think of our task as not just teaching skills, but as also engaging our students with the human source of the knowledge and skills they are learning, we will be able to make our teaching more engaging to their imaginations, more meaningful to them, and more interesting for the teacher too. This approach may seem a bit intimidating at first. There are so many new terms, and it may seem as though it would make huge time demands on teachers. I hope it will become clear as we progress that this won't be the case.

## Romantic understanding

### The limits of reality, the extremes of experience

The fairy-story about Jack and the Beanstalk typically engages four-and five-year-old children in Western societies. Children do not commonly interrupt the story to ask about the genetic make-up of bean-seeds that can grow up to the sky, nor do they wonder what supports giants and their country up there. They accept magic as long as it keeps the narrative flowing and the story exciting. The story of Anne of Green Gables, that typically engages ten-year-old children in Western societies (and is perhaps surprisingly even more engaging in some Eastern countries), is not less a fiction than Jack the Giant Killer. Unlike Jack's story, however, it makes accommodations with reality that its young literate readers or hearers require. Even fantasies like the Star Wars movies or the Harry Potter novels need to make accommodations to reality that mark them as a different genre of fiction from Jack and the Beanstalk or Cinderella. Something happens to children in Western societies between five and ten years of age that makes the kind of stories enjoyed when younger unacceptable when older. The thing that happens is that children become literate in a peculiar way started, as far as we can tell, by the Greeks.

The reason literacy encourages a new conception of reality and a fascination with its extreme and odd features is not hard to understand. If, with unusual generosity, we were to arrange to fly you all to a north Italian hill-town and invite you to explore it, you would be a bit foolish to pull out a magnifying glass and start examining the details of your hotel carpet and wall paper, before working gradually down the corridor and into the street. You'd be smarter to set about locating the main square and the cathedral, discovering where the town walls were, and examining the more unusual buildings. Your attention would also be drawn to behaviors, clothing, artifacts, customs, etc. that were most unfamiliar to you. That is, in any new environment we strive to orient ourselves by establishing the limits of the environment and its most outstanding features. It is a sensible strategy, and we see it vividly at work when literacy stimulates a new conception of reality. As Jerome Bruner puts it, “literacy comes into its full power as a goad to the redefinition of reality” (1988, p. 205).

In part, this common fascination we see in newly literate students with, say, the subject matter of the Guinness Book of Records (Who was the biggest, and smallest, or hairiest person? Who had the longest fingernails? Who has pulled the heaviest weight with their teeth, and so on?) is a search for a kind of cognitive security about their own life and circumstances. They are not fascinated by who had the longest fingernails for that person's sake, but because it tells them something about proper scale and about norms, by limiting the possible. That is, they are seeking knowledge about themselves. So when we suggest that

our teaching will gain by working out how to engage students with the limits of the real world and human experience, we do not mean that the teacher will thereby remove any focus on their everyday world. We want our teaching to empower students to deal better with precisely that. The everyday world around them can become more meaningful, and meaningful in a new way, if we can help to orient the learners to it through attention to the limits or context within which it exists. So emphasis on the extremes and limits of reality does not remove students' attention from everyday experience, but rather it enables them to see it in a new light — a light that should give them greater security and confidence in dealing with it.

## Associating with the heroic

The “collective version of reality” that myths provide for many oral cultures have the enormous psychological value of creating comfort and security for those who believe them. Today we may feel confident in believing that the world is not a flat disk sitting on the back of vast elephant that stands on the back of an even vaster turtle. Things just aren't that way, our sense of reality insists. One trouble with this new sense of reality is that, initially at least, the student has little sense of its limits or of how it works. This can be, and usually is, disturbing, perhaps a little frightening. But the mind has strategies for dealing with this potential source of insecurity. The commonest strategy that is employed to meet this threat is to make a mental association with someone or something that seems able to overcome the threats posed by our everyday reality.

Examples of such associations are evident in the boy or girl who becomes a fan of a particular football team, or thinks of a particular basketball player in heroic terms, or who collects all the records and watches all the videos of a particular singer or film-star, and thinks of that singer or actor in heroic terms. The association can be with a huge variety of people or things, though. One could associate with a political figure, or some other celebrity — a Princess Diana or a Mother Theresa or a Martin Luther King, Jr. — or one could associate with one's school or with another institution. The power of forming such associations is so versatile that the range of objects with which one might associate seems limitless: the tenacity of a weed on a stormy rock-face, the ingenuity that has created an insulated plastic cup, the beauty and power of an animal, the elegance of a mathematical proof, etc.

What is going on when we make these kinds of associations with sports heroes, film stars, tenacious weeds, or elegant proofs? One way to describe why people commonly make such powerful associations is to see it as a response to the threats posed by reality. We form associations with those things or people who seem best equipped to overcome the threats that hem us in. The hero is like us, or like we would wish to be, hemmed in by the world but somehow overcoming it in a way we would want to emulate. The sports hero or movie star has the strength, power, freedom, money that we lack but want to associate with. Like many cognitive tools that come along with early literacy, this capacity does not simply go away as literacy become more sophisticated. If you pause to consider who are your heroes, or what institutions or ideas or objects you form such associations with, you may discover what you still feel insecure about.

This association with people or institutions, or even makes of automobile or computer, is primarily an association with the heroic qualities which they exemplify. It's not so much the particular pop-singer or football team that engages the association; rather it is their great talent that, for a moment and in part, we incorporate into ourselves. The heroic qualities with which we associate can be enormously varied, and depend, in significant degree, on what we are insecure about. In mass society, where a general anonymity is the norm, celebrity itself attracts our associating capacity. But power, compassion, energy, genius, creativity — any human quality can form the anchor for an association.

Often we can use the cognitive tool of associating with heroic qualities to highlight almost any feature of reality. It becomes a way in which we can imbue things with significance and, reciprocally, make them engaging to our associating capacity. For example, one can focus on any object — say, a book on your desk — and project into it some heroic qualities. In the case of the book, one might highlight the millennia of human ingenuity that have created this compact object crammed with tiny symbols that serve us as an externalized memory. It can contain an endless array of information and convey the emotions and

experience of other people in distant times and places. Human ingenuity has made the crammed pages hospitable to the eye by means of tiny punctuation marks and divisions within the text. These tiny marks helped to democratize reading, and have probably had more influence on human affairs than all the armies of history. Well, you can see how one can romanticize the object; one highlights it, marks it off from its surroundings. One may then see it even more clearly as an object with which one can form an association — one associates with that human ingenuity.

This ability to project into objects the qualities that then enable us to associate with them easily — if you follow that doubling-back-on-itself procedure — is an important cognitive tool in making aspects of reality lively and engaging. We will be wise to think about how we can “heroize” aspects of whatever we are teaching. (You can see examples in the Teaching and Curriculum section of this web site.)

## **The sense of wonder**

Related to our ability to make associations with heroic qualities is our ability to see any object as wonderful. It is easiest to feel the emotion of wonder in the face of the more dramatic features of the natural world — the mountain view, the gold and scarlet sunsets, the vast waterfalls, the immensity of space. Wonder is a kind of emotional memory of what we have lost. But the “overflow of powerful feelings” that accompanies wonder can, like the associations I discuss above, be directed to almost any object. Everything we see around us can be re-seen in the light of wonder.

Wonder can be an engine of intellectual inquiry. It is a part of literate rationality’s persistent questioning. Wonder can be silent in front of nature’s grandeur, but it mostly encourages us to ask questions. “I wonder why...” is the start of scientific thinking. Nature, no longer participated in, becomes an object of wonder and inquiry. I wonder why the bathwater rises as I sink into it? I wonder how many worms there are in the garden? I wonder why the sky is blue? I wonder when this section of text will end!?

Stimulating wonder energizes the imagination. We can, of course, learn in a way that is purely utilitarian — that is, not using the power to evoke wonder. We see too often professors and teachers who seem to have had a triple imagination by-pass.

In our teaching, then, we will be sensible to attend to how one can evoke a sense of wonder related to the topic we are dealing with. This will require the teacher to reflect on the topic and locate what is wonderful within it. Anything, seen in the right light, can be seen to be wonderful. Even if we are learning how to deal with the everyday transactions of shopping, one can evoke some sense of wonder by embedding the task in a context that draws attention to the astonishing variety of goods brought from all the corners of the world, the ingenuity that has gone into arranging food in hygienic containers with stunning efficiency, the work of generations of chemists and physicists that has gone to making such taken-for-granted products as toothpaste and other cleaners, fruit juices, frozen peas, and so on. This does not demand lengthy factual lessons on the background of each item, but rather a constant alertness to the wonder of the shop. It is hard for some people to pull back from utilitarian routines, but the teaching task required to stimulate imagination involves the teacher in constantly locating the immediate objects of the lesson in the wider context of wonder, and, of course, being alert to the students’ recognition of wonder. A part of good teaching that helps the transition to a richer understanding is to locate something wonderful in everything we teach; doing so will not only make learning easier for the student, but will also be more interesting and satisfying for the teacher.

## **Knowledge and human meaning**

Scientific knowledge, especially as stacked in textbooks, has an aura of objectivity; it is secure, uninfluenced by what we might hope or fear, a solid assertion of what is true. Or, at least, that is what we are supposed to think. That kind of security and objectivity has commonly been seen as one of the great

products of the development of rationality. But all kinds of rational areas of inquiry, while they aspire to secure knowledge, are also products of human beings thinking and working. Knowledge is a product of human hopes and fears; our emotions are crucial to its development, and its meaning cannot be properly understood as though it is some bloodless and emotionless enterprise.

If we look back to those Greeks again to see how knowledge was treated shortly after literacy became common and fluent, we find some interesting clues to how we might engage our students' minds in learning. One form of knowledge that was clearly very popular was that Guinness Book of Records kind — exotic and, if possible, scandalous details of the behaviors of the distant and only partially known Egyptians, Lybians, Scythians, Persians, and so on. The historian Herodotus supplied precisely this kind of material. His narrative is full of stories about how Amazon women did not marry until they had killed an enemy in battle, or how Egyptian women attended market and dealt with business while the men stayed home and did the weaving, or that twenty-two tons of gold were used in Babylon to build the figure of the god Bel (the Biblical Baal), or how the Egyptians caught crocodiles.

A common element of these exotic stories is their human agency. That is, events or buildings or behaviors are seen as products of human choices, hopes, fears, or intentions. Things didn't just happen as a result of historical forces; people made them happen as a result of their emotions. A great deal of Herodotus's text bears more than a trivial resemblance to those tabloids one sees at supermarket checkouts in Western countries. He was, at one level, a superb journalist. He always had his eye open for a good "story" — and the story always had a "human-interest angle." The knowledge that engages Herodotus is what we have come to call — since the Romantic movement — "romantic."

Text-books have tended to disguise from us the simple truth that all knowledge is human knowledge. Too often textbook writers seem to forget this. Science and math texts seem particularly "inhuman," at a point when human emotions provide one of the easiest tools that students have available for understanding the material in texts. The educational trick is to show knowledge as the product of human beings' ingenuity, energy, passions, hopes, fears, and so on. People like us made it, invented it, discovered it, formulated it for human purposes, with human motives. Instead of representing knowledge as a given — telling students the rules for comma use or solving quadratic equations and giving them exercises till they get the rules right — we might make the knowledge memorable and meaningful by re-embedding it in the contexts of its original invention or human uses. This might be dramatically shown in mathematics. When students learn a mathematical algorithm by seeing who invented it and for what purpose, it is more easily learned and better understood and remembered. If students are not taught in the traditional way that interior opposite angles in a figure are congruent, and work at examples till they seem to understand the principle, but are instead told the story of how Eratosthenes measured the circumference of the earth very precisely two millennia ago, using this geometric theorem, then learning is typically much more efficacious.

So while teaching we might sensibly remember that everything we teach has a human source — the comma and quadratic equations were invented by someone — and that bringing to the fore the human emotions, ambitions, intentions, fears, and so on, we can expect to engage our students' imaginations in learning. In addition, by using this cognitive tool we will in turn help students develop it further, enabling them to see human emotions behind and below the surface features they have to deal with. Such a tool simply enriches life.

## Changing the context

Routine activity is one of the great enemies of the imagination, and we are creatures who seek and rely on routine as often as possible. J.G. Bennett half-jokingly described what he called "The Law of mental Declension," which stated that we perform every task at the lowest intellectual level possible. A corollary is that we try to make every task we are faced by as simple as possible as quickly as possible. Take driving a car. Initially, when we are learning to drive, we have to be extremely attentive to every movement and action. As we become more efficient we attend less and less at a conscious level, until eventually much of our driving activity takes place at an automatic level that requires very little conscious attention. Bennett

argues that this “law” operates for students in school as well, so that they will address any challenge at the lowest level possible. For many students much of the time, the greatest challenge they face is simply to be able to show the teacher they know what is going on in the classroom in case they are asked a question. Bennett uses his “law” to argue for presenting challenges that require students to attend and work intellectually at a high conscious level.

Bennett’s “law” is relevant here because it helps to clarify one continual and persistent difficulty for our aim to engage students’ imaginations routinely. Imaginative intellectual activity requires energy whereas “the law of mental declension” constantly encourages students to deal with the challenges of the classroom with the lowest possible output of intellectual energy. So our challenge is to provide challenges of a kind that can be met only at a high level of conscious attention and that stimulate students to engage with them energetically. And, to be realistic, we can’t expect to manage this all day long for every student. But we can expect to manage it fairly frequently during any day. And it is more fun to keep trying than not.

As students increasingly become familiar with the routines of the everyday world around them, they increasingly deal with them in a routine and, as far as possible, at an automatic level. At the same time they are becoming aware of the variety of the world, making “romantic” engagements to certain parts of it, and are attracted by the strange, exotic, and extreme. The classroom is often the antithesis of these engaging features of the world, and is a place of routines.

So another principle for imaginatively engaging students is to change the context of learning quite frequently. Changing the context breaks routines and generates intellectual energy by presenting students with an intellectual challenge that can’t be dealt with at an automatic level. Traditional ways of changing contexts have involved such activities as field-trips. But we want to focus on a somewhat different kind of context changing, a kind that is concerned more with the intellectual activity required of the student and that doesn’t take hugely elaborate activity by the teacher—though of course there’s no end to the time and energy the teacher can expend, as all teachers know.

In a history class, for example, one can change the context by asking the students to pretend to be participants in the events being studied, and perhaps to debate the conflicting positions of the combatants. In science, the teacher can put on a wig and pretend to be the inventor or discoverer whose work is being studied, describing the work, the opposition they faced, and what motivated them—all that’s needed is some odd clothing and a funny accent to create a sufficiently changed context. In math, a few old sheets can transform the class into a bunch of ancient Greeks discovering some geometrical theorem. A group of teachers might get together and plan a semester around some topic—say, “edible grains.” The whole curriculum can then be planned for the semester around this topic—the history of edible grains and their role in human settlements, the geography of the sources of the grains, where they were planted and why, the mathematics of grain production, sales, and distribution, the biology of grains and their growth, and so on. The students can each be given roles in such a semester long unit, such that their school day would be involved with their tasks in the growth, development, distribution, and study of grains.

## **The imaginative eye**

We have seen that literacy in the ancient Mediterranean world was tied up in developing Western conceptions of reality. Literacy became a complex tool for trying to mirror reality, however problematic or even impossible we might consider that ambition to have been. But before that ancient Greek ambition took form, literacy had been used in a less complicated way to reflect what was real and true. That is, symbols were devised to indicate how many barrels of figs someone had for trade, or how many cedar logs, or how much wine. By looking at such techniques, found in the earliest examples of literacy, we can discover further clues about how we might make our teaching more appealing and useful to our students’ imaginations.

Since 1919 a huge number of tablets have been excavated from the ancient port of Ugarit in Syria. Most were written around 1400 BCE. About two-thirds of the tablets are made up of lists — lists of taxes, rations, supplies, pay, inventories, receipts, census records, personal and geographical place names, purchases, loans, and so on. If we were to calculate the kinds of records sorted on computer disks at the moment, we might find that a similar proportion involves lists. The list is ever-present in our culture, and has been one of the most common uses of literacy as well as one of the earliest.

Literacy is a process in which the eye begins to replace the ear as a major source of information. Perhaps that puts it too strongly, but clearly the eye becomes much more important. Equally clearly, the way the eye derives information from texts is different from the way the ear derives information from sounds. The process of teaching— if it is to be most effective — might, then, involve some use of the techniques that make it easier for the eye to retrieve knowledge.

Once information could be stored in a written list, the mind was released from having to memorize items by tying them into memorable rhyming, imagistic stories—so myths began to die away. In addition, the list remained available for visual inspection at any time, and by anyone who could read. Once lists are recorded, they are open to, and often invite, reordering, categorization, classification.

Organizing the items in a list can raise questions, such as whether to classify a tomato as a fruit or a vegetable. The activity of making lists and manipulating them can help students to see one of the basic uses and values of literacy. The teacher might invite the student to write a list of fruits, for example, and then invite them to reorganize the list into those fruits whose skins we eat, those whose insides are in segments, those with stones in the middle, those which grow on bushes, those which grow in “our” country, and those which grow in clusters. A list of sports may be broken into those in which we kick a ball, those in which we hit a ball with something, those in which the goal is off the ground, those we play indoors, those in which more than two teams compete, and those which can be played with only two people.

The list is simply one of a tool that may enlarge students’ capacities. A related one is the flow chart. This is simply a list organized by the principle of temporal sequence. It often has a direct and powerful utility. Practice in applying these eye-oriented skills can provide both straightforward exercises and also the pleasure that always comes with mastery of a new and useful tool. Designing a flow-chart of the student’s daily activities, and the main choice points faced during the day, can be quite difficult, but engaging, to them. It is often surprising in the way that the chart can lay out to the eye features of experience not previously represented that way. Such a representation can provide a new sense of control over activities.

There is a set of similar tools in which the eye’s immediate access gives increasing control over features of reality. In our instruction, then, we will want to exploit uses of lists, flowcharts, diagrams, tables, databases, sociograms, recipes, and so on. In many of these tools, events and processes and information can be routinely made available for reflection and action in new ways. Teachers who have not commonly used such tools might be surprised at how imaginatively engaging most students find even the simple activity of making and manipulating lists.

## Conclusion

By focusing attention on students’ imaginations, we bring to the fore a set of somewhat unfamiliar topics. Or at least, if they are not so unfamiliar in our everyday experience — heroes and the extreme and exotic and so on — they are, in our experience, not so familiar in texts on teaching. And in our work represented on this web site, we want to make them central to the task of helping students successfully attain flexible understanding.

We think that it is no harder, and indeed rather easier, to learn in a manner that engages these cognitive tools than it is merely to learn to master knowledge efficiently for utilitarian purposes. We also think that it is no harder to teach using these cognitive tools than in more routine ways. It may be a bit of a change

initially—though perhaps less of a change for good teachers than may appear likely on the face of it—but we suspect that over time teachers will find this manner of planning and teaching more hospitable, and certainly more enjoyable and rewarding.

In particular, we want to show how teachers can think of instruction not only in terms of acquisition of skills and knowledge but also as an enlargement of students' cognitive tool kits. The teacher will be both using the cognitive tools students have available, and, reciprocally, developing those tools by exercising and enlarging students' use of them. In this process, however, we need to work out how those cognitive tools can be developed in practice in the everyday literacy classroom. So let us, perhaps with some relief, turn from this realm of theory to the practical implications of the theor, which is explored in various examples in the Teaching and Curriculum section

In concluding, it might be worth reflecting on the set of characteristics mentioned above, and how they help us to see why Harry Potter and Anne of Green Gables, Luke Skywalker and Officer Ripley, Alexander and Cleopatra, engage people's imaginations, and how we might use such characteristics in everyday teaching.