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Myths About Learning

How the Big Five Helps to Explain Some of the Myths

How We Know What Isn't So

--title of book by Thomas Gilovitch

The Demon-Haunted World

--title of book by Carl Sagan

Guide to This Chapter:

- What We Mean by Myths About Learning
- An Alphabetical Listing, from Accelerated Learning to Speed Reading, with Some Comments on How the Big Five Relates to Many of Them

The dictionary typically provides two principle definitions for "myth." On the one hand, a myth is a traditional story, often based on historical events, that is thought to explain something (e.g., Penelope's nightly unraveling to explain or illustrate loyalty, in this case to her husband, Ulysses). A myth also is a false belief that is maintained uncritically, especially by groups that have a special interest in perpetuating the belief (e.g., the "world is flat" society). We are interested at this point in the second kind of myth—false beliefs held uncritically. In this chapter, we will identify myths about learning, beliefs that research has determined to be without foundation. Tom Gilovitch's book cited above is all about everyday myths in this sense: things we believe that have no factual foundation, such as the belief in so-called "hot streaks" in basketball (read his book to find out why they do not exist). Carl Sagan's book cited above is also about this kind of myth, which he calls "demons," beliefs held strongly by some but which research finds baseless, such as horoscopes.

In 1984, the U.S. Army Research Institute asked the National Academy of Sciences to form a committee to evaluate "nonordinary" techniques for improving human performance. This request followed the urging of some who felt that "New Age" educational technologies that had been developed outside

Traits in School

N	E	O	A	C
Need for Stability	**Extraversion**	**Originality**	**Accommodation**	**Consolidation**
N+ Reactive	E+ Extraverted	O+ Explorer	A+ Adapter	C+ Focused
N= Responsive	E= Ambiverted	O= Moderate	A= Negotiator	C= Balanced
N- Resilient	E- Introverted	O- Preserver	A- Challenger	C- Flexible
N1: Worry	**E1: Approach Level**	**O1: Imagination**	**A1: Service**	**C1:Thoroughness**
N2: Temper	**E2: Group Orientation**	**O2: Range of Interests**	**A2: Compliance**	**C2: Structure**
N3: Outlook	**E3: Pace**	**O3: Innovation**	**A3: Humility**	**C3: Ambition**
N4: Coping Level	**E4: Leadership**	**O4: Zoom Scale**	**A4: Speak Out Level**	**C4: Concentration**
	E5: Trust			**C5: Methodicalness**
	E6: Tact			

the mainstream might have some basis for their claims of achieving high results. The defense establishment was willing to consider any technique that might provide a competitive edge in the armed services. They wanted to know, however, which beliefs had merit (i.e., evidence that they really worked) and which were myths. John Swets, a consultant from Cambridge, Massachusetts, was appointed chair of the committee, and Daniel Druckman, formerly of the consulting firm of Booz Allen Hamilton, was appointed study director. Their results were published as *Enhancing Human Performance: Issues, Theories, and Techniques* (Druckman and Swets, 1988).

During the next two years, reaction was intense and widespread. As a result, the committee reformed in 1990 to evaluate areas that had not been included in the earlier study and to address concerns raised by that study. Robert Bjork was brought in as committee chair and Druckman was retained as study director. Their findings were published as *In the Mind's Eye: Enhancing Human Performance* (Druckman and Bjork, 1991). This extensive effort directed towards separating myth from fact formed the basis of a section in my (Pierce's) book, *The Owner's Manual for the Brain* (2006, 3rd Ed.). For more on the role of the teacher and on what we know about effective learning practices, try my book!.

The list beginning in the next paragraph reflects the proceedings of these National Academy of Sciences investigative committees, plus the result of other independent investigators. We list here myths about learning—learning methodologies that have claimed positive results but haven't stood up to the scrutiny of scientific investigation.

Alphabetical List of Myths About Learning

Accelerated Learning. This much publicized approach to teaching and learning has a following of true believers. However, it appears to be more of a marketing technique than anything else. We say this because it is nothing but old, tried-and-true techniques repackaged to look like something new—a classic marketing ploy. Repackage it, and you can sell more books, curriculum material, workshops, consulting hours, and so forth. We are aware of two well-designed studies (cited in the National Academy of Science books) that took on the claims of acceleration advocates (Bush, 1986; Wagner and Tilney, 1983). They identified 11 defining elements for accelerated learning. Of these 11, only two were nontraditional and therefore "unique" to accelerated learning as a part of their approach: the use of

relaxation techniques and the use of music as an accompaniment to learning drills (as in reciting verb conjugations). Their research found that comparison groups that did not use music and relaxation performed at a higher level than the music and relaxation groups. They found that the music interfered with attentional focus—it was a distraction and interfered with moving from consciousness to memory. As evidence of this finding, I (Jane) recall being a participant in a training session where music was played during a group activity. As a singer, I was very distracted and found myself more engaged in humming harmony with the music than in participating in the group activity.

In addition to finding the music counterproductive, they found that the relaxation exercises caused learners to be excessively relaxed—a moderate level of tension, or arousal, such as that provided by a small caffeine hit or some brief exercise, is required for optimal learning. No basis was found for the high claims of accelerated learning's superior results. Good accelerated learning is basically no different from good teaching, generally. Claims of 5- to 50-fold improvements were based on poor research designs. The two best studies cited earlier found that SALTT (Suggestopedia Accelerated Learning and Teaching Technique) produced 40-50% lower results than traditional methods. The other nine elements of accelerated learning were all deemed to be traditional characteristics of effective teaching already in mainstream use: advance organizers, dramatic presentation, spacing, practice, mnemonic aids, student-generated elaborations, tests, imagery, and cooperation in groups. It would be interesting to conduct a study to see if the use of music is more effective with E+ students (who like sensory bombardment), O+ students (who like variety), and/or C- students, who enjoy shifting attention. In a similar vein, it would be interesting to conduct a study on the use of relaxation techniques to see if it is more effective with N+ students (who have a higher-than-average response to stress).

Achievement Tests. A number of studies that culminated (2006) recently with the research of Robert Gordon (Center for American Progress), Thomas J. Kane (Harvard), and Douglas Staiger (Dartmouth) discredit the notion that the myriad of achievement tests used for both college admissions and teacher selection predict future success as a student or as a teacher. These tests include the Scholastic Achievement Test (SAT), the Miller Analogies Test, the Law School Admission Test (LSAT), the General Management Admission Test (GMAT), and the Graduate Record Examinations (GRE), among others. For students, these tests predict grades on lower-level courses, such as survey courses, that primarily test for lower-level cognitive skills such as memory (recall and recognition), understanding of formulas, and basic reasoning. Hence, they predict grades in the first year of college rather well, second-year college grades less well, and third/fourth year grades not at all. The same goes for graduate school: They predict first year (i.e., survey courses) grades, but not the second and subsequent years that require sophisticated synthetic, analytical, and creative ability—the higher cognitive skills. They also do not predict success in a career (e.g., publishing) as measured by salary, position, or achievement. As for teachers, these tests do not point to future success in teaching.

Altered Consciousness. The notion here is that by using either exercises or devices one can alter an individual's consciousness to improve learning rates (e.g., time required for acquisition and

mastery, effectiveness of long-term memory storage). The goal is to assist the individual in attaining an optimal level of arousal for learning. While continued research on these techniques is worthy, the evidence to date is that they do not significantly enhance learning. Devices such as "Hemi-Sync" that stimulate a specific brain area apparently do not affect learning effectiveness. As pointed out earlier, relaxation techniques can adversely impact learning by reducing attention and arousal to such a degree that insufficient attention is focused on the new learning, and material fails to become established in long-term memory. Satisfactory methodologies are apparently unavailable for researching these claims. There is one exception here: Persons who are high in N may require some amount of relaxation (such as aerobic exercise) after a particularly stressful episode and before trying to learn. Excessive stress levels (that include increased blood pulse rate, perspiration, acid in the stomach, dilation of the eyes, and so forth) interfere with learning, and they should be reduced by aerobic exercise before engaging in effortful mental activity.

Asian Mathematics Superiority. Malcolm Gladwell (2008; also see Dehaene, 1997) explodes the myth that Asians are genetically superior to Westerners in mathematics ability. It has nothing to do with ability, but with language and culture. Western languages (and some Eastern) have words for numbers that do not reflect the logical structure of numbers, thereby making calculations unnecessarily cumbersome, especially mental calculations (e.g., adding numbers in your head). In many Asian languages (Chinese, Japanese, Korean), the words for numbers are substantially shorter (e.g., Chinese *qi* versus English *seven*) than their English (and German, French, Spanish, and so forth) equivalents. As a consequence, students who speak European languages average remembering 7 numbers learned in two seconds, while Chinese remember 10. In addition, Chinese words for numbers follow a consistent logical pattern, where 21 is "two-ten-one," 17 is "ten-seven," and 4,321 is "four-thousand-three-hundred-two-ten-one." With all numbers aligned consistently in this manner, not only are mental calculations easier and quicker, but written ones are as well. The performance gap becomes significant when these two features—shorter words and more logical structure—combine with what Gladwell calls the "rice paddy" culture and its support for persistence and long, hard work (i.e., longer school days and longer school years). Therefore, the gap is not due to individual ability, rather to the evolved nature of the language and the cultural norm for hard work/study. Western (and Eastern, for that matter) learners who are higher in A (more obedient) and C (focused work ethic and style) will have an edge.

Equipotentiality. This is the notion that every person has the same potential as every other person in the world. Or, as the military recruiting poster exhorted, "You can be anything you want to be." This notion is drummed into young children through such characters as Chipper Chipmunk, and it is plain false. However, in one sense it is true. I (Pierce) can be a school principal if I choose to be. In fact, I once interviewed to become one. However, I realized at the time that I didn't have the temperament for it. I am too high in N to be effective in handling the high stress load of the typical principal. I am insufficiently extraverted, preferring to spend longer stretches of time in solitary work than would be advisable for a school principle. I lack the knack for organization and methodology that is so neces-

sary for effective administration. It would not be a natural fit for me, but I could do it. I might get ulcers or high blood pressure, but I could do it. But why do it if I lack the natural temperament? Human evolution has resulted with people who have thousands of different temperaments, each suited for different work. If everyone had the same temperament, then everyone would want to be the "principal." Imagine that! This entire book is based on the assumption that we each have different gifts, different personalities, and that our personal satisfaction is dependent on recognizing our uniqueness and finding outlets that build on our strengths.

Full Brain. Ever heard someone say, "My brain is full!" No known record exists to our knowledge of a brain that has been used to capacity: a brain that cannot remember another fact or face, a brain that cannot learn another language or skill. What is happening when one says their brain is full is that they are fatigued from learning new material. Estimates are that the typical person spends only about 15% of their awake time engaged in what is called "effortful learning"—that is, mentally engaged in something that is challenging, such as memorizing new vocabulary words (especially in a non-native language), struggling with a new vocal technique or dance step, or reading the technical manual for a new piece of software. This effortful activity—effortful in the sense that you have to try hard, you can't just coast on past learning accomplishments—is tiring. To have talent in an area makes it less tiring, but tiring nonetheless, assuming it is really effortful. The rest of our waking hours we spend in practice, or in taking what we already know and perhaps experimenting with it, as in trying slight variations with a new serving technique we have learned for our tennis game. Some have estimated that our brains have the capacity of 10,000,000 books of 1,000 pages each. We are nowhere near capacity. How about you? Dig in, dig deep! N+O- individuals are most likely to lament that they've reached their capacity, as they tend to be more stressed by the frustration that accompanies new learning, and less interested as a general rule in learning material that is noticeably different from what they have already acquired along the way. All that is required for them to continue "filling their brains" is to take a nice break from study, get some exercise, do something familiar for a time, and then get back to "effortful engagement."

Graduate Degrees. Educators, licensing agencies, government bodies, school systems, and especially universities have long maintained that teachers who possess a Master's degree make more effective teachers than those who have only a Bachelor's. What this means is that teachers who have taken more advanced courses in their subject area (e.g., English teachers who have taken such courses as Shakespeare's histories, the poetry of Wordsworth and Coleridge, and the plays of the Restoration; or, science teachers who have taken courses in optics, particle theory, and cloning techniques) and who have written a research paper (or thesis) are thought to be more effective than teachers who have taken mostly survey courses (e.g., English teachers who have taken American Literature, British Literature, World Literature in Translation, and History of the English Language; science teachers who have taken general physics, general chemistry, qualitative analysis, general biology, and history of science). As mentioned in the last chapter, this isn't so. Robert Gordon (Center for American Progress), Thomas J. Kane (Harvard), and Douglas Staiger (Dartmouth) designed research to ascertain the validity of the tra-

ditional claim that teachers with Master's degrees were better teachers (Gordon, Kane, & Staiger, 2006). They found that the *possession of a master's degree fails to predict success as a teacher*. Their recommendation: design a way to hire prospective teachers for a probationary period, and then look for the kinds of success behaviors identified in the previous chapter.

IQ is a Single Number. We have already discussed the issue of intelligence as a single, versus a multiple quality, in Chapter 3. It bears repeating here, although only briefly. People are smart at different things. There is no single number that can adequately reveal a person's mental ability. A person with an "IQ" of 120 sounds like someone who could be mentally above average at everything, but while that is occasionally the case, it is usually not the case. A person can be smart with words and inept with interpersonal skills, smart with music and inept with spatial analysis, smart with mathematics and inept with emotional acuity. To treat IQ as a single number is like treating basketball ability as a single number: to say a person was 90th percentile overall in basketball ability could mask, for example, poor speed, poor rebounding, or poor defense, while excellence in many other areas would compensate. However, if you want a rebounding specialist at a critical point in a game, you don't put someone in the game who is 90th percentile overall—you want/need someone who is very high in rebounding, forgetting the rest for the moment. Look for a person's mental strength and build on it. Forget using single numbers as estimates of mental ability. When you hear someone say, "Sam is smart," retort, "Smart at what?" For the different "kinds of smartness," review Chapter 3.

IQ is Unteachable. Intelligence has long been thought to be entirely inherited. That is no longer the case. Clearly, there are elements of mental ability that are largely inherited and relatively impervious to change, such as tone deafness and color blindness. However, as Anders Ericsson has demonstrated, practice can make more perfect (see discussion under "Practice" in Chapter 14). Malcolm Gladwell (2008) reminds us, "Working hard is what really successful people do…." (p. 239). He relates how several individuals and groups that were thought to be merely talented, in fact, got their 10,000 hours of practice in by the time they needed to enter professional status. The Beatles got their 10,000 hours of practice during gigs in Hamburg. Bill Gates got his 10,000 hours of programming in through a combination of fortunate opportunities in academic and other early computer labs. One difference on math tests globally is that cultures that teach persistence do better. Gladwell, in his book *Outliers* (2008), relates an experiment in which successful completion of a long, boring, demographic-type questionnaire was found to predict math achievement—the more missing items on the demographic survey, the lower the math achievement. Perseverance and practice are key for developing expertise. Yale University psychologist Robert Sternberg calls intelligence "mental self-management," and persistence and practice are certainly aspects of mental self-management. Such persistence comes more naturally for lower O (who are not bored so much by repetition) and higher C people (who naturally take to concentrating and being methodical). Sternberg, a specialist on intelligence, once accepted a contract that challenged him to design a program that would raise the "IQ" of Venezuela, a country that had suffered an intellectual drought under a long, malevolent dictatorship. It worked! You can find more about it both in Sternberg's writings (e.g., 1988) and by searching "Venezuela Intelligence Pro-

ject" on the web. Other factors known to positively affect intelligence levels include nutrition (both during and after gestation), birth weights, adequate verbal interaction with parents/caregivers, and, of course, the opportunity to experience well-designed formal education.

Multitasking. Essentially, there is no such thing as multitasking. The mind cannot pay attention to more than one activity at one time. When a second activity is introduced, the mind's attention shifts to the second activity. To the degree that the initial activity is automatic (i.e., has the benefit of extensive practice, as in riding a bicycle), then the automatic activity may go on along with the new activity that requires attention, like reading a book while riding a stationary bike. However, should the automatic activity require attention, the mind would shift from the new activity/reading back to the previous activity. An example would be riding a bicycle down an untraveled country road, and reading something while riding, only to come upon a section of the road with potholes. Avoiding potholes is not automatic and would require attention. So, multitasking is never doing two things at once that both require full attention—at best, it is alternate-tasking, where one's attention moves back and forth between/among two or more activities. This practice increases the chance of error—riding the bike down an untraveled country road while reading or talking on a cell phone is fine, but it increases the chance that you will miss seeing the broken glass that will puncture your tire.

Ergonomics researcher Christopher Wickens, director of the University of Illinois Aviation Research Laboratory, says (see *APA Monitor,* January 1994, pp. 16 ff.) that when one must pay attention to multiple inputs or tasks, it helps if the inputs involve brain resources that are different ("noncompeting"). For example, if one must pay attention to two visual inputs, that is more difficult (and more error prone) than paying attention to one visual and one auditory input. He has identified three "dimensions"—i.e., sets of resource trade-offs common throughout a variety of workplace settings: visual vs. auditory, verbal-linguistic vs. spatial-manipulative, and response vs. perception-cognition. In each of these cases, alternating between each member of a pair (i.e., watching a child swimming while talking to a friend, talking to a friend while knitting, and driving a car while observing traffic) is safer—and easier—than alternating between two mental activities in the same mode (i.e., watching a child swimming while watching another child diving, talking to a friend while listening to the radio, driving a car while working a Rubik's cube), but just because it is easier does not mean that it is safer than focusing on a single activity (i.e., watching a child swimming, driving with no—or little—traffic, knitting).

There is a sex difference with respect to multitasking, or alternate-tasking. Male-differentiated brains find it easier to handle multitasking, such as talking while building something. The typical male brain has brain areas for these functions that interfere with each other less than they do in the typical female brain (see more about this in *The Owner's Manual for the Brain,* 3rd Ed., Section 31.4*).* Still, it is an illusion to think one is actually multitasking. When you are attempting to do two things at once, you increase the chance of error involving the activity that is not occupying your full attention but is on autopilot—watch a basketball game while folding laundry, and you'll either miss a good play or mismatch your socks! And don't even think about talking or texting with a cell phone while negotiating a busy inter-

section. The solution is to focus on one task until you reach an agreeable stopping point, and then shift to another task if you like. This is not multitasking, but alternate-tasking. If you insist on simultaneously engaging in two or more tasks, make sure only one involves full attention and/or is high risk. This is easier for C+ individuals who find it easier to focus and concentrate on one thing. It is also easier and more natural for E- individuals who prefer lower levels and fewer kinds of sensory stimulation. O+ individuals are also more tempted to multitask in order to avoid boredom. Individuals who are E+, O+, *and* C- are clearly prone to multitasking and should take special precautions to avoid serious errors. Namely, they need to identify activities that require full attention, either for safety or quality reasons, and allocate their small amount of energy for focused attention on those activities, one at a time.

Photographic (Eidetic) Memory. Research on memory has taken a significant turn in recent years. Memory used to be regarded as a structure; now it is seen as a process. A memory was thought of as a single unit with an identifiable place of residence somewhere in the brain that could be recalled when necessary. Now a memory is viewed as a reconstruction from many different chunks stored redundantly throughout the brain (see more in Pierce's chapter on memory in *The Owner's Manual for the Brain,* 2006, 3rd Ed.). This new view of memory was brought dramatically to the public's awareness after John Dean's testimony at the Watergate hearings. Viewers were initially impressed with Dean's avowed excellent memory for detail. But when his testimony was later compared with accurate records of conversations, viewers (and Dean himself) were flabbergasted to learn that most of his testimony was at best flawed and at worst made up. So, memory is not photographic. Some people have better, more reliable memories than others, depending on their body chemistry, their nutritional habits, their exercise patterns, their stress levels, their techniques for remembering, and the degree to which they practice their retrieval. Every remembrance is a rapid reconstruction of elements, some more accurate than others. The more one practices a memory (as in telling a joke, reciting a poem, singing a song, and so forth), the more consistent one's reconstruction will be. Of course, if you practice a faulty reconstruction, then you will be consistently wrong! Be humble about memory, and understand that random elements can cause retrieval to be faulty. Use a memory partner, acknowledging that two or more retrievers are better than any one. Traits have a role here, as those low in A tend to be more confident in their memory because of their intrinsic competitiveness, yet they are as likely as others to have flawed retrievals. What makes them less reliable is they are as less likely to admit errors in reconstructing a memory. Those high in O are tempted to embellish, to supply missing elements, just to make it interesting. On the other hand, O+ individuals are more likely to be adept at creating pneumonic aids because of their vivid imaginations. Those higher in E are plagued by their high degree of sensory bombardment and its associated propensity for including irrelevant elements from the myriad of sensory data surrounding the event being retrieved. A+ and C+ individuals have a memory advantage--the former try harder out of wanting to please, and the latter try harder because of their disciplined ambition.

Sex Differences. Traditionally boys have been thought to excel in math and girls in language, and that these differences were innate. Early research attempting to clarify these differences suspected that they were caused by cultural practices (e.g., not buying erector sets and Legos for girls, not buying

dolls for boys) rather than heredity. More recent research has confirmed that, with the gradual elimination of cultural sex discrimination, the differences in math and language performance are disappearing (Lerner and Steinberg, 2004, p. 241). Math differences are at their greatest in grade 1 but approach parity by grade 12. Verbal ability is equal in grade 1, but girls are superior by grade 6, then the gap gets smaller around grade 12. However, the sex gap in sports favors boys throughout. Apparently society has placed a higher priority on eliminating sex biases in math and language but not in sports. As girls find their "voice" (recall Mary Belenky's [1997] observation that the traditional American girl is not encouraged to develop her own "voice," but to defer to others), these inequalities melt. The degree to which a girl has her "voice" developed is associated with her level of A (accommodation), with lower A girls having stronger opinions and demands. I (Jane) am a low A, yet I grew up in a conservative family with parents who were 38 and 45 when I was born. Throughout my youth I heard such maxims as "Don't talk back," "Pretty is as pretty does," and "Children should be seen and not heard." Around age 30, I finally found my "voice" to allow my challenger free rein, anda life partner in Pierce who could accept that voice. Interestingly, the two countries with the most legislation aimed at eliminating sex discrimination (Sweden and the U.S.) have the smallest academic performance gaps on the world scene.

Sleep and Learn. The National Science Council investigated the notion that persons can learn while asleep. For example, place an audio learning program (e.g., a CD with vocabulary, verb conjugations, and so forth) in your iPod or other playback device that you can program to start playing after you've fallen asleep. They found no evidence that this practice results in learning gains while an individual is engaged in verified sleep. There is some evidence that one can learn during light sleep, as opposed to deep sleep, but the gains are minimal compared to what one can learn after a refreshing night's sleep. Disturbing sleep raises ethical, as well as medical, issues. We know of no evidence that traits make a difference in one's ability to learn while asleep. Sleep is the time for new learning from the previous day to become established. Don't interfere with it!

Speed Reading. Back in the 1950s, the U.S. Department of the Navy studied the effectiveness of so-called speed reading programs and found that they were neither more nor less than skimming techniques. Students were trained to read topic sentences (the first and last in the paragraph), and the comprehension tests used to evaluate the training only questioned the content in these sentences. When students were tested on material that was scattered randomly throughout the reading passages, comprehension plummeted. More recently, University of Missouri at Kansas City educational psychologist Ronald Carver (1990) published a review of research on reading speed. Several findings emerged:

- The normal reading speed is 200 to 300 words per minute.
- Faster speeds involve skipping words.
- Skipping words results in decreased comprehension.

We suggest you follow these guidelines:

Traits in School

- When you are reading only to find new information on a subject you are already familiar with, then skimming (reading faster than 300 words per minute) makes sense.
- When you are reading for detailed understanding of a more unfamiliar subject, you should slow down your reading, probably below 200 words per minute.
- For most other reading, accept the typical rate of 200 to 300 words per minute.
- Don't claim to read at a thousand or more words per minute. That's not reading, according to research; it's skimming. Calling it "speed reading" is like referring to microwaving a dinner-in-a-box as "cooking." It's not; it's nuking or warming.

Speed of reading is clearly related to the Big Five traits. Those most able to focus, concentrate, not get distracted, and read in the most efficient manner possible are most likely to be N- (calm, at ease, stress resistant), E- (solitary, quiet), A+ (obedient), and/or C+ (disciplined, concentrating). The opposites of these are more likely to be inefficient readers. However, they can find ways to compensate for the trait that decreases efficiency. For example, someone who is N+ and aroused as the result of a stressful episode could first engage in some aerobic exercise, and then try reading, now that their bodies have returned from parasympathetic to sympathetic arousal. Someone who is E+ and wanting to be active could try reading while exercising on a stationary bicycle. Someone who is A- and is resisting the assignment could make a contest out of it, and see if they can read the assignment within an arbitrary time limit. Someone who is C- could try eliminating all distractions for a set period, say an hour or more, until the task is complete: no TV, no music, closed door, cell phone off. The latter instance will find that they finish their assignments more than twice as fast as when they try to read with distractions. Whether an O+ is an efficient reader depends on whether the material is different, new, complex, appealing to the imagination—otherwise, they are likely to be bored, will find their mind wandering, and will lose efficiency. They would be well advised to read in shorter spurts, taking breaks to relieve the monotony. O- readers will be more efficient when reading familiar material—if it is too different or complex, they are likely to become frustrated. Again, read in shorter spurts with frequent breaks.

Transfer of Learning. In their landmark book *Transfer on Trial*, Detterman and Sternberg (1993) explode the myth that more intelligent individuals are better at transferring new learning to remote situations. They talk about near and remote transfer (or proximal and distal transfer). The former involves learning a principle such as the proper way to prune a pear tree, and then applying the same principle to pruning an apple tree. Whether or not this transfer is appropriate, people do commonly engage in this kind of transfer. The nature of near transfer is that the contexts in which you apply the learning are extremely similar. However, the other kind of transfer, remote transfer, is the one that has been thought to be unique to the highly intelligent. Remote transfer involves applying a principle to a new situation that does not resemble the context in which one learned the principle originally. Once I (Pierce) solved a problem for a company that had baffled their experts for a year. They had taken the same problem-solving course that I had, but they had not practiced the technique since leaving the workshop in which they learned it. On the other hand, I had been teaching the technique

for five years and had tried it on several dozen different kinds of problems. I had developed a deep sense of the *kind* of situations that could be solved by the technique. When I encountered this company's problem, I recognized the underlying structure of the problem and its relevance to my technique. Their experts were unable to make the remote transfer because they had not developed a feel for the kind of context in which it was appropriate. They were only able to use the technique on problems that closely resembled the original problem presented in the workshop, and no problem that they had encountered since the workshop was close enough to the original, in terms of its surface characteristics, for them to recognize the technique's applicability. Detterman and Sternberg argue that, if you want people to be able to transfer principles, formulas, concepts, and the like from one situation to another, then you have to give them extensive practice in using the learning in a wide variety of contexts. Individuals higher in O are more likely to find remote transfer interesting. On the other hand those higher in O are less likely to want to practice the same technique repeatedly, while those lower in O would be comfortable with extensive practice. Those lower in A, out of pride and/or competitiveness, could be resistant to using someone else's technique until such time as they make it their own.

Now that some of the main myths that interfere with learning have been exposed and thrown over, the next chapter will take a look at how we can use our knowledge of traits in the development of curriculum, lesson plans, and, in general, making instruction more personally meaningful.