Transfer of Learning: What It Is and Why It's Important

We talk about "transfer of learning" when ... learning is displayed in a situation somewhat different from that in which the original learning occurred. If the transfer situation is so different that the use of learning encounters some barrier or difficulty, we speak of "problem solving." When the situation is greatly different and the distance of transfer needed is greater still, we speak of creativity.

— Wilbert McKeachie, Teaching and Learning in the College Classroom

What kind of learning made it possible for someone to see that lightning in fact a "big spark," or that the process of metal rusting is in fact "slow combustion," or to see that the development of the reciprocating gasoline engine required that it be seen as a series of "controlled explosions"? The answer is transfer of learning. These apparently simple examples of transfer, however, are not as simple as they appear to be. Despite years of research in psychology, education, and other fields, transfer remains a mysterious process. In explaining transfer, I will be presenting a framework largely missing from standard accounts. But it’s a crucial framework, for our very future depends on our ability to transfer our learning.

Transfer refers to how previous learning influences current and future learning, and how past or current learning is applied or adapted to similar or novel situations. Transfer, then, isn’t so much an instructional and learning technique as a way of thinking, perceiving, and processing information. Therefore it’s fundamental to all learning. Without it we couldn’t engage our everyday thinking and reasoning nor even acquire the most basic of motor skills; transfer is responsible for the simplest of ideas and for the highest achievements of humankind.
THE BASICS OF WHAT TRANSFER OF LEARNING IS

In one sense, we are all experts in transfer, yet in another and more important sense, we are all lacking in higher order transfer skills. The more skilled we are in transfer, the more creative and efficient is our thinking and performance. Transfer is a deceptively simple concept. The simple aspect of transfer is exemplified whenever we say, for example, "it's like ... it's equivalent to ... for example ... it's akin to ... for instance ... it's the same as ... by the same token ... similarly ... in the same way ... it reminds me of ... it resembles ... it's comparable to ... or it's analogous to ... . Transfer involves the use of figurative language with analogies and metaphors; the deceptive aspect of transfer is that when we simply say "it's like," it's the same transfer of learning that Albert Einstein used in creating his theory of relativity.

The word transfer is derived from trans, meaning across or over, and ferre, meaning to bear, thus, to carry over. In both a trivial and a profound sense—as no situation is ever exactly the same—all learning is transfer of learning. In short, virtually all learning involves carrying over previous learning to new situations. Failure to carry over previous learning all too frequently leads to rigid patterns of behavior and thinking. In psychology we use the term functional fixedness to describe such rigid patterns. For example, when you're in a hotel room and you need to tighten a screw on your computer case but you don't have a screwdriver, many of us wouldn't think of using (or seeing) a dime, or a fingernail file or a credit card as a screwdriver.

We constantly transfer our previous learning and experience in order to more quickly and efficiently learn a new skill. A person who plays the piano, for example, will learn to play an accordion more quickly and efficiently than a person who has no experience with the piano. Similarly, experience with ice skating can decrease the learning time of a person learning roller skating. There's a game called Short Tennis for children. It's a mini version of regular tennis and is constructed to retain most of the movement elements of regular tennis. It has a smaller court, smaller rackets, and lower net height, and a foam rubber ball. Recent research demonstrates that skills and movements learned by children in Short Tennis later transfer to Lawn Tennis.

A fundamental transfer-of-learning task confronting education today is the need to improve computer competency. Thus the challenge facing all computer instruction is to teach not merely the keystrokes (training) necessary to perform program tasks but to develop mental models of the underlying structure (learning) of the different user interfaces. Complicating this issue is the problem of having to deal with multiple hardware architectures, operating systems, and user interfaces. But with the trend of moving toward common user interfaces based on graphics such as Microsoft Windows, transfer of learning is accelerated. Just as many countries have been changing language-based road signs to include icons (i.e., signs with the word Food are paired with a picture of a dinner plate, connoting a restaurant), to make the
in exactly the same context, the essential problem in transfer is when and how something is perceived as being the same as or equivalent to something else. To say that X is like Y isn't the simple problem that it appears to be.

Because on a basic level transfer appears so simple and commonsensical, we may all too often do the opposite of what appears to be obvious. Negative transfer from our past experience frequently occurs. What appears to be logical, or reasonable, or just plain commonsense, however, is all too often counterintuitive, or in the absence of adequate knowledge, predictions of when transfer will occur may be counterintuitive or incorrect, leading to negative transfer. Novices and children—lacking sufficient knowledge—often transfer inappropriately, as when a penguin is not seen as a bird, or a whale is called a fish, or when a bat is seen as a bird. On perceptual grounds only, who would think a deer and a whale would be the same? These inappropriate transfers are the consequence of not possessing sufficient knowledge and theory of the phenomena we are attempting to transfer (see chapters 6 and 9). Though not complex, transfer isn’t a simple matter.

Transfer is the neurocognitive mechanism underlying many phenomena (see chapter 11). Because of its fundamental nature, transfer is known by many names. Transfer is the basis of mental abstraction, analogical relations, classification, generalization, generic thinking, induction, invariance, isomorphic relations, logical inference, metaphor, and constructing mental models. The very concept of inference is a metaphor. Etymologically, it’s a reference to the “transfer” or “carrying over” meaning from one situation to another. Indeed, transfer is so fundamental that to explain it is to repeat the same thing over and over, using different terms from different fields, in different contexts, on different levels of abstraction, and in different orders of magnitude.

Think of the basic structure of transfer being characterized by the mathematical form of \(2 + 2 = 4\), and just as we can plug apples, peaches, pears, plums, and Bicks into this abstract structure, so, too, we plug into the general transfer form: abstraction, analogical relations, archetypical thinking, classification, generalization, generic thinking, induction, invariance, isomorphic relations, logical inference, metaphor, and mental models. The \(2 + 2 = 4\) is an example of generic thinking. By such transfer thinking, if you understand one of these concepts, you can generally understand the other. It’s a kind of repetition. To say that I am repeating the same thing, however, is not to say that I am simply repeating the exact same thing. In mathematics such repetition is called the differentiation of an invariant through its various mathematical forms; it’s like counting from 10 to 100, then counting from 100 to 1000, that is, 10 is to 100 as 100 is to 1000. In other areas transfer may be known as variation on a theme.

The research on teaching for transfer clearly shows that for transfer to occur, the original learning must be repeatedly reinforced with multiple examples or similar concepts in multiple contexts, and I would add, on different levels and orders of magnitude. Teaching that promotes transfer, then, involves returning again and again to an idea or procedure but on different levels and in different contexts, with apparently different examples. The great psychologist Jean Piaget referred to this method as epigenetic, as a kind of spiral where each new turn is a higher order manifestation of the order below it, just as 2 is to 4 and 4 is to 8 (see chapter 12). The bare-bones essence of transfer, then, is simple: it’s equivalence and it can be summarized by the “=” sign. In order to further understand transfer of learning, it’s useful to briefly look a little more technically at the levels and kinds of transfer of learning.

**Evolution of Transfer from Rats to Chimps to Humans**

From the most primitive of life forms to the best and the brightest of human kind, transfer ability varies. This variation in ability at transfer is, in part, founded on biological evolutionary advances that are hard-wired into our brain. For example, if a rat is taught to respond to the image of a triangle drawn with solid line \(T_1\), when shown a “different” triangle drawn with line made up of a series of dots \(T_2\), it is unable to recognise \(T_1\) as the same object as \(T_2\). Similarly, a rat trained to respond to a white triangle with black background will not respond to a black triangle with white background.

A chimpanzee and a small child, however, will respond to both triangles as the same object. they will transfer their experience. On a more abstract level, when we recognize a familiar melody played in a new key, or in a different octave, we are engaging in transfer because the new melody is in fact not the same set of notes as we are familiar with. Transfer can also be seen in the ability of some people to “see sounds” or to “hear colors.” This is known as cross-modal synthesis. Such people literally have their neurologic “wires crossed.” A variant of synesthesia in us “normal” people results in experiencing the sound of the word “we” as being “brighter” and “higher” than the word “do.”

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**FIGURE 1**

The evolution of sameness: sameness.

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The capability to transfer sounds into colors, to perceive "different" melodies, or the transposition of different octaves into the same musical experience, appears to be built into both single brain cells and hardwired into our neurological pathways. Once again the capacity for transposition is related to one's place on the evolutionary scale. If a rat is trained to go toward a light of intensity L1 and to avoid intensity L2, which is twice the intensity of L1, and is then presented with intensity L2 and L4, where L2 is twice the intensity of L1, the rat will not respond. Chimpanzees and young children will make the transposition. They will consider intensity L2 in the first situation the same as intensity L4 in the second situation. Put in analogical terms, L1:L2 = L2:L4. This is the same process as hearing a melody played in one key as being the same melody played in a different key, even though not a single note in the new octave is the same as the notes in the old octave.

Transfer is integrally responsible for classifying things. We generally place something into a category by its similarity to things in that category. The Nobel Laureate in economics, Frederick von Hayek, in his little known book, The Sensory Order: An Inquiry into the Foundations of Theoretical Psychology, sees transfer as being hardwired into our neurological system. Under the heading, "The Nervous System as an Instrument of Classification," Hayek says, "A wide range of mental phenomena, such as discrimination, equivalence of stimuli, generalization, transfer, abstraction and conceptual thought may all be interpreted as different forms of the same process of classification which is operative in creating the sensory order." Certainly von Hayek himself, writing in both economics and psychology, possessed a high level of transfer expertise.

In a very early article, I also considered transfer to be a general phenomenon, seeing it as a form of analogical reasoning. I suggested that transfer "may be equated with the well known constructs of stimulus generalization, constancy, transposition phenomena, isomorphic relations, metaphor, abstraction, transfer, and the more recent signature of science, model," and I have since continued to do research on transfer in both a theoretical and applied manner. I also believe that there is sufficient evidence showing that the basic structure of transfer is hardwired into our brains (see chapter 11).

**FIGURE 2**
The evolution of sameness: abstract transposition.

An important ingredient in understanding something is to know where it belongs in a larger scheme and to become familiar with its parts. Knowing what kinds of tools are available for a particular kind of job, for example, not only allows us to select the tool that will do the job, but it provides us with a framework and a plan for how to do the job. It follows that tools create (and limit) the possibilities for what and how a job can be done. The same is true for the concepts and words that we describe tools with. The more extensive vocabulary we have, the more ways we have for seeing, describing, and doing something.

It is now time to spell out what I see as the six levels of transfer. They comprise a kind of simple-taxon system (a taxonomy is a system of classification): Level 1, nonspecific transfer; Level 2, application transfer; Level 3, context transfer; Level 4, near transfer; Level 5, far transfer; and, Level 6, displacement or creative transfer. Such a "system" has generally been missing in the transfer literature. Although there are labels for different kinds of transfer, such as lateral transfer and vertical transfer, there is no system of classification directly based on a precise degree of similarity.

**Level 1. Nonspecific transfer.** Because all learning depends on some connection to past learning, all learning in this sense is transfer of learning. Although this is true and profoundly necessary, it's also somewhat trivial in terms of our everyday experience of transfer.

**Level 2. Application transfer.** This refers to applying what one has learned to a specific situation. For example, after having learned about a word-processing system, one is then able to apply the learning to actually operating a word processor. This may seem to be an outrageously condescending example, but I assure you that this level of transfer is a problem in the learning of many tasks.

**Level 3. Context transfer.** This refers to applying what one has learned in a slightly different situation. Often a change in context, though the learned task is exactly the same, may result in lack of transfer. An analogy to a change in context interfering with transfer is "place learning" in psychology. Sometimes what is learned is welded to the place where it is learned, because the physical place provides the cues necessary for retrieving the learning. Most people have had the experience of not recognizing someone even though they are looking right at them. This often happens when we have no experience or expectation for the person being in a particular place.

**Level 4. Near transfer.** This refers to when previous knowledge is transferred to new situations that are closely similar but not identical to previous situations. A person's experience in roller skating when transferred to ice skating is an example of near-procedural transfer. Learning to calculate the amount
of floor tile needed for a living room using your prior classroom experience in figuring the area of rectangles is another example. As obvious as this may seem, many of us don't even make this simple kind of transfer either.

Level 5: Far transfer. This refers to applying learning to situations that are quite dissimilar to the original learning. Examples like seeing lightning as a big spark and other similar transfers often involved in invention and product development. What we ordinarily call analogical reasoning is clearly evident in this level of transfer thinking.

Level 6: Displacement or creative transfer. This refers to transferring learning in a way that leads to more than the insight of that is like this: In the interaction of the newly discovered similarity between the old and the new, a new concept is created.

Each level of transfer just described is based on judgments of similarity. But just how similar something is to another thing is largely a subjective matter, and there is no simple way to determine how quantitatively similar something X is to another something Y. This is, after all, the very problem of transfer: what do we mean when we say something is similar to something, or is like something else? There is no simple way to say if something is a case of near transfer or far transfer. The essential problem of similarity or equivalency has yet to be solved. Until some genius solves this problem, the psychologist Walter Weimer's succinct conclusion will have to suffice: "Stimuli are equivalent, in the final analysis, only because they mean the same thing." I will address the relationship of meaning to transfer in chapter 7.

Knowledge base greatly influences whether something is considered near or far transfer. What is near transfer to an expert may be far transfer to a novice. This is why the identical elements theory of transfer is not as simple as it first appears to be (see chapter 5). Since nothing—by definition—is identical to anything else, identical elements are in fact only similar elements. This fact is often overlooked, especially when designing instructional programs. Thus, much of the perception of similarity, like beauty, is in the mind of the perceiver, not in the concrete features of an object or event.

Consider levels 1 and 2 as a simple, basic level of transfer. Transfer proper at all, level 3 is simply the application of learning, reserving level 4 as near transfer, and levels 5 and 6 as far transfer. Finally, I would like to note that what I consider to be significant transfer is transfer that requires the learning of something new in order to make the transfer. Levels 4, 5, and 6 typically require such new learning. Without the requirement of new learning, the transfer in my view is not transfer but simply applying the same learning.

In the same way that understanding the levels of transfer of learning allows us to recognize how, when, and where transfer occurs, so does understanding the kinds of transfer of learning. Transfer can be classified into two basic categories: (a) the type of knowledge that the transfer is based on and (b) the specific kinds of transfer. The first category corresponds to the five types of knowledge that I describe in chapter 6 (declarative, procedural, strategic, conditional, and theoretical knowledge), the second category is based on transfer itself. I should point out that none of the kinds of transfer are necessarily mutually exclusive.

1. Content to content transfer is making use of what we know in one subject area to the learning of another area. Content knowledge is what I describe in chapter 6 as declarative knowledge. Declarative-to-declarative transfer occurs whenever existing knowledge of some content area facilitates or interferes with simple learning. It also refers to learning new knowledge that may be somewhat different from the original learning. Knowledge about proteins, fats, and carbohydrates from chemistry, for example, will be useful in health education. Knowing how small groups work will help in understanding business meetings. Content or declarative knowledge may provide us with a general framework. It may help us to elaborate, or it may provide an analog for a second content area.

2. Procedural to procedural transfer, also known as skill to skill transfer, refers to using the procedures learned in one skill area in another skill area. For example, skills used in riding a bicycle typically transfer to driving a motorcycle or driving a car. Procedures are sequences of actions. Sequences learned on one computer program may transfer to operating another similar program.

3. Declarative-to-procedural transfer occurs when learning about something helps in actually doing something. For example, knowledge about computers enables us to learn programming procedures; knowledge about corporate stocks enables us to more proficiently play the stock market.

4. Procedural to declarative is when practical experience in an area helps us to learn more abstract knowledge of the area. Practical experience in constructing electronic circuits, for example, will help in learning theoretical knowledge of electronics. Knowledge of programming may help in learning computer theory.

5. Strategic transfer is when knowledge about our mental processes, such as how we learn or remember, is gained through monitoring our mental activities during learning. Knowledge of how we solved one problem may transfer to the solving of another problem.

6. Conditional transfer is when knowledge concerning when to apply the knowledge learned in one context may be appropriate for transferring it to another context.

7. Theoretical transfer is understanding deep-level relationships of cause and effect in one area that can be transferred to another. Recognizing that a spark and lightning are the same, that combustion and rusting are the same, that the inverse square law applies to planets and the tides, are all examples of theoretical transfer.

8. General or nonspecific transfer is when previous knowledge that is not specific to the training situation transfers to other situations even though no ap
importance of transfer of learning

As I have shown in the opening of this chapter, so pervasive is the transfer function, that it shouldn't come as a surprise that its effects are equally pervasive. We constantly reason in everyday life using transfer (see chapter 4). The history of science, invention, technology transfer, and everyday life is replete with people who are good at transfer. We often develop and see new things in terms of past experience, as being like something we are already familiar with. When cars were first invented, they were seen as "horseless carriages." With the advent of the computer age, we now have electronic "mail" sent via our computer terminals. Small laptop computers are called electronic "notepads" in analogy with paper note pads. The development of a technology capable of analyzing the complex structure of our DNA has found its way into the court room. Each person's DNA code is unique to them like fingerprints: thus we call it DNA "fingerprinting."

In addition, when we learn from history (if, indeed, we do), it involves transfer. In fact, the only way we can learn from history is by transfer. There's no other way. We do it by seeing the past as relevant to or as being like the present, that is, by transferring past events to present situations. This is the very definition of transfer of learning (see chapter 5). As obvious as it may now appear, history isn't typically thought of as transfer of learning. Learning from history, however, is transfer of learning; it's the very paradigm of transfer: past knowledge influencing present learning.

Many advances in science are made on the basis of a simple its like type of transfer. The invention of a new representation (e.g., Einstein's theory of relativity. Darwin's theory of evolution) seems to involve a basic insight into the nature of the problem to be solved. Einstein is famous for his use of everyday mental images of concrete situations and analogies for thinking about abstract problems. Charles Darwin transferred the idea of the selective (i.e., artificial) breeding of animals to his development of the principle of natural selection to his theory of evolution. In place of a farmer selectively picking what genetic traits of an animal are to be reproduced or enhanced, Darwin saw that nature or natural selection was at work in the place of the farmer. It seems simple now, but it wasn't then.

The great physicist Louis De Broglie noticed that the mathematical equations of another well-known physicist, Neils Bohr, who described the orbits of an electron, were the same equations used to describe the vibrating waves of a violin string. With this transfer of his learning, De Broglie revolutionized atomic physics and laid the foundations of quantum mechanics. It may well be that the inventing of such representations by transfer of learning is the highest intellectual achievement.

In school, students often learn essentially the same concept in different courses, but these concepts are given different labels by different disciplines, so children are not aware they are learning the same concept. Teachers, too, seldom recognize the similarities that exist across disciplines. It is never pointed out, for example, that the concept of learning in psychology, socialization in sociology, adaptation in biology, and acculturation in anthropology are very similar concepts. Learning is the process of acquiring knowledge or skill through practice, training, or experience; socialization is the process whereby individuals assimilate the values and behavior patterns of their culture and social position; adaptation is the alteration in an organism that results from natural selection enabling the organism to survive. acculturation is the process.
of adopting cultural traits or social patterns of another culture. Such a systems approach to learning is cognitively and instructionally beneficial in a number of ways.

First, learning the above four individual concepts requires a certain amount of memory space. If, however, students can see how the four concepts of learning, socialization, adaptation, and acculturation are essentially the same, they can "chunk" them into one concept and thus ease load on memory.

Second, once the four concepts are seen as being alike, they become associated with each other and other material associated with them facilitates memory retrieval. Third, the four concepts are now cogitatively integrated for a deeper understanding, with each individual concept reinforcing the other. Fourth, because the four concepts aren’t identical, certain aspects from one of the concepts may reveal something new about the other that was not known prior to the transfer. Transfer of learning is thus not only extremely economical in terms of an individual’s learning resources, it creates creativity and learning itself, it helps us to efficiently store, remember, integrate, process, and retrieve information.

Finally, one form of transfer is the use of analogies and metaphors. Reasoning on the basis of analogy is called analogical reasoning, a kind of reasoning in which one thing is inferred to be similar to another thing on the basis of a shared, common, or similar structure. A well-known analogy is the use of knowledge about the human eye that was transferred to the development of the camera:

<table>
<thead>
<tr>
<th>Human eye</th>
<th>Camera</th>
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<tbody>
<tr>
<td>lens</td>
<td>lens</td>
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<tr>
<td>retina</td>
<td>film</td>
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<tr>
<td>inverted image</td>
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<td>eyelid</td>
<td>lens cap</td>
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<td>lens accommodation</td>
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<td>pupil dilation</td>
<td>aperture</td>
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Without going into the fine distinctions traditionally made by linguists, grammarians, and philosophers on the differences between analogies, metaphors, and similes, it’s sufficient for our purposes here to understand that the transfer function undergirds analogical and metaphorical reasoning and many other similar processes that are called by different names when they are used in different ways. Some years ago, I suggested that analogical reasoning was not just a kind of literary style of reasoning but was fundamental to all learning. Since that time, many researchers have concluded that analogical reasoning is a central mechanism—if not the primary mechanism—in learning, thinking, and reasoning. Finally, the use of analogies and analogical transfer is increasingly being used in the classroom for teaching science, and is often viewed as one of the primary means of drawing on students’ existing knowledge.

Not only does most research show that both the failures and successes in achieving transfer overwhelmingly come from learning situations involving the most basic levels of learning, but as some researchers clearly suggest, even most of the transfer studies that do manage to demonstrate some low level of transfer don’t deserve to be called transfer of learning. With some reservations, I tend to concur. This is what the issue is all about.

Douglas Detterman is one exponent of the view that most of the transfer studies that do manage to demonstrate some low level of transfer don’t deserve to be called transfer of learning. I say he is one proponent of this view because there aren’t many. Considered the Holy grail of education, the transfer catechism doesn’t have many critics.

Not only is it important to include critics of a particular point of view, it’s unforgivable not to. Anything else is propaganda, not science or scholarship. More pragmatically, we learn as much from critics—perhaps more—than we do from advocates. Before continuing with Detterman’s criticisms, however, it’s useful to briefly look at one early critic whose view is virtually never cited in the literature, and whose view makes Detterman’s criticism pale by comparison. Whereas Detterman’s criticisms center on the instructional methods used in transfer research, Edward Kelly’s claim is much more radical. He rejects the very idea of transfer, claiming that “the concept of transfer does not serve any educationally useful purpose.” He maintains that transfer is “an empirically meaningless or a worthless notion.” This is not just rhetoric. Kelly has his logical and philosophical reasons. First he says that the term transfer is simply a metaphor; that nothing actually gets transferred or “moved” from one domain or thought to another. His position is that all prior learning either simply enhances or, conversely, inhibits learning; he finds it impossible to learn anything without past learning’s influence. Therefore the concept of transfer has no special merit or claim. For Kelly, all is learning—clear and simple. Kelly further objects to the term use, as in using past knowledge, and to the term apply as in applying past knowledge. He says that these terms and the very concept of transfer are vague, ambiguous, and trite.

Although logically there is some truth to Kelly’s criticisms, at the risk of dismissing him too quickly, to explore them here in more depth would take me too far afield. Suffice it to say, that in a round-about way he would agree with the view of this book and a few other researchers like Gick and Holyoak “that no empirical or theoretical chasm separates transfer from the general topic of learning,” and that “A theory of Transfer is of necessity a theory of learning and inference.” In my view, Detterman’s criticisms are more to the immediate point.

Detterman’s view is based on his review of many typical studies of transfer. In one representative study, children were taught to transfer general prin-
principles from one situation to a different one. A child would learn to stack tires on top of each other, which would then let a doll reach a shelf where other tires were to be stacked. A similar problem involved requiring the child to stack bales of hay on top of each other so that a farmer doll could then reach a tractor. Three sets of such problems were used where the general principles of stacking, pulling, or swinging were the same. It can be seen that the surface structure for each story in the set was different, but the structure was the same. If a child was not able to solve a problem, the experimenter demonstrated the solution to them. Children were always asked to repeat the solution to the problem, at which time the next structurally identical problem was presented. Given this methodology, it's not surprising, says Detterman, that these children learned the "rules of the game" over the three problem sets. Learning the rules of the game, however, is not what most would consider transfer of learning. Such experiments, says Detterman, are more a demonstration of rule induction than transfer.

In another representative study of college students, subjects saw solutions to different kinds of algebra word problems to which they solved either equivalent or very similar problems. The equivalent problems were identical except for using different numbers. Nothing else was different. Four such experiments showed that students could solve equivalent problems only when they had the sample problems available to them while solving the similar problems. Subjects infrequently solved the similar problems, even under the best of conditions. As Detterman points out, the result of these kinds of studies is not likely to surprise algebra teachers, but it surprised him.

A close look at the famous 1908 experiment of Charles Judd, who first challenged Thorndike's identical elements model, suggests that transfer not only occurs on the basis of identical elements between two problems, but also can occur via the abstract general principle underlying a phenomena (see chapter 5). In Judd's experiment two groups of boys threw darts at an underwater target. In the experimental group, the boys were told about how water reflected light and that the principle of refraction would be useful for hitting the target. The control group of boys practiced but received no instruction. The transfer test was simply hitting the targets at different depths. The experimental group outperformed the control group on the so-called transfer tests. Detterman says that the result is not surprising, because the experimental manipulation was essentially to teach the experimental group a strategy and to tell them to use it. But this hardly constitutes transfer, he says. Although it shows that the strategy taught was successful at producing improved performance and that subjects followed directions when told to use the strategy, he notes that, like the representative studies above, Judd's experiment in fact doesn't show anything approaching spontaneous or significant transfer. This is why transfer experiments, more frequently than not, don't in fact show transfer.

Instruction on refraction of light by water should have been given in a situation where it wasn't possible for subjects to directly make the connection between the experiment and the instruction. The idea of general transfer is for subjects to use a previously learned principle in a new situation. Teaching the principle in such close association with testing for transfer is not much different from actually telling subjects that they should use the principle just taught them. And telling a subject to use a principle is not transfer. It's simply following instructions.

Detterman's criticism may be summarized as follows: When subjects (a) are told that previous material may be useful in the solution of a new problem, (b) are informed about strategies and methods known to improve learning on specific kinds of material, (c) are instructed to use those strategies on that material, (d) have the similarity pointed out to them "in some not-so-subtle way," (e) or given other hints about the similarity between the problems to be solved, Detterman says it "hardly seems reasonable to refer to the solution of the new problem as the result of transfer." He goes on to suggest that studies claiming transfer can be said to have achieved transfer only by using the "most generous of criteria and would not meet the classical definition of transfer." He concludes by saying that in all the studies he is familiar with, transfer is achieved only by using the above kinds of "tricks," as he calls them. In keeping with the title of the heading for this section, what Detterman is saying in so many words is that what most call teaching for transfer, is in fact teaching the actual transfer itself. He also concludes his review of the research by saying that when transfer does occurs, "it requires heroic efforts to produce and even with [such] draconian measures, the amount of transfer is small." What more is there to say?

CONCLUSION

Let me close by noting that in slow-changing traditional societies, there's much less need for transfer of learning. The demands of our modern civilization, however, make transfer increasingly important. In our highly complex, rapidly changing, Information Age, the ability to transfer or generalize from the familiar to the less familiar, from the old to the new, not only renders our world predictable and understandable, but is a necessity for our adaptation to the technological and global demands of the 21st century.

Notes

3. I would like to thank Mr. David Allie of Phoenix Systems for these examples from his introductory material on transfer of learning in teaching computer competencies.
Transfer of Learning: What It Is and Why It's Important

2. Transfer of Learning: What It Is and Why It's Important


Ibid, p. 50.


Jacobson's experiment and according to Detterman with many other transfer experiments—is that the experimenters were not blind to the subjects' conditions. That is, apparently the same experimenter that gave instructions on re-