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Haskell's Taxonomies Of Transfer Of Learning: Implications For Classroom Instruction

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ABSTRACT

Two taxonomies for transfer of learning are described. The first specifies six levels or degrees of transfer. The second employs two categories for classifying kinds of transfer: one is based on five types of knowledge, and the other is based on transfer per se, of which there are fourteen types. The implications of transfer of learning for classroom instruction are discussed.

Haskell's Taxonomies of Transfer of Learning: Implications for Classroom Instruction

Research suggests that transfer of learning differs in kind, occurs at different levels, and influences all learning, memory, problem-solving, and cognitive processes (Mayer, 1987). Although the transfer of basic skills, knowledge, and thinking skills is integral to our educational aspirations and expectations, many students believe that little of what they learned in school benefited them later in life. Not surprisingly, transfer of learning persists as one of the most vexing problems in the classroom (Bevevino, Dengel, & Adams, 1999; Borich & Tombari, 1997; Rossett, 1997). In addressing this critical educational issue, Haskell (2001) developed two taxonomies: one for levels of transfer and one for kinds of transfer.

Levels and Kinds of Transfer of Learning

Transfer of learning refers to the influence of past learning on current and future learning and to the application or adaptation of previous or current learning to similar or novel situations (Haskell, 2001). Since virtually all learning entails connecting past learning to new situations, all transfer, therefore, entails transfer of learning. However, because nothing ever recurs in exactly identical ways or in exactly identical contexts, the fundamental problem in transfer involves perceiving when and how something is identical to or equivalent to something else. Haskell perceives other problems that plague our understanding of transfer: the need to differentiate between levels of transfer and kinds of transfer and the need to develop taxonomy for each. Accordingly, both of Haskell's taxonomies of learning will be described below.

Levels of Transfer

Haskell's (2001) taxonomy for levels of transfer- a system of classification directly reflecting six precise degrees of similarity—has generally been absent in the transfer literature. Each level of transfer within this taxonomy, therefore, adds greater specificity when judging the impact of connecting past learning to new situations.

Level 1: Nonspecific transfer
Nonspecific transfer implies that all learning essentially is transfer of learning because all learning is contingent upon being connected to past learning. This level of transfer, though true and thoroughly necessary, is perhaps trivial in light of daily experiences of transfer.

Level 2: Application transfer
Application transfer refers to the application of what we have learned to specific situations. For example, after having learned about computer programming, we are then able to genuinely apply this knowledge to actually program a computer.

Level 3: Context transfer
Context transfer, in contrast, refers to the application of what we have learned under slightly different situations. A lack of transfer may occur if the context changes, even if the learned task itself does not change. We experience this type

of transfer when "place learning" plays a central role in learning because learning may be retrieved due to cues being provided by the physical place itself. For example, some of us have failed to recognize someone even though they may be staring at us.

Level 4: Near transfer
Near transfer occurs when we transfer previous knowledge to new situations closely similar to, yet not identical to, initial situations. Transferring our experiences associated with driving a car with a manual transmission to driving a truck with a manual transmission reflects an example of near procedural transfer.

Level 5: Far transfer
Far transfer entails the application of learning to situations entirely dissimilar to the initial learning. This level of transfer of learning reflects analogical reasoning. For example, learning about logarithms in algebra and applying this knowledge in assessing the growth of bacteria in microbiology.

Level 6: Displacement or creative transfer
Displacement or creative transfer results in the creation of a new concept because of the interaction of the newly perceived similarity between the new and the old. This type of transfer of learning involves more than the mere insight that something is similar to something else. For example, the effects of the downward pull of the earth's uniform gravitational field that we experience while standing on earth is equivalent to the effects that we experience while standing in an elevator that is accelerating upwards at precisely the right rate. This transfer of learning, that acceleration and gravity is actually the same thing, refers to the Principle of Equivalence—a basic postulate of Einstein's Theory of General Relativity.

Significant transfer, according to Haskell (2001), requires that we learn something new in order to produce the transfer. As such, Level 4 (near transfer) and Levels 5 and 6 (far transfer) fit this category. Levels 1 and 2, however, are merely simple learning, not transfer per se. Level 3, on the other hand, is essentially the application of learning. Haskell insists that unless new learning occurs, all we have done is to merely apply the same learning rather than transfer it.

Kinds of Transfer

Just as our understanding of the different levels of transfer informs us of when, how, and where transfer occurs, our grasping the different kinds of transfer of learning accomplishes the same thing. Haskell's (2001) taxonomy for kinds of transfer implies that types of transfer may be classified into two categories: (1) What type of knowledge is the transfer predicated on? (2) What specific kind of transfer is involved?

Transfer based on types of knowledge. According to Haskell's (2001) first category, transfer is classified based on the type of knowledge involved: "…declarative, procedural, strategic, conditional, and theoretical knowledge…." (p.31). Scientists working with cognition and instruction typically mention the first four types: Haskell added the fifth one. (1) Declarative knowledge essentially is knowledge of or about anything. For example, we either know or do not know what a black hole is. (2) Procedural knowledge is basically how-to knowledge. For example, successfully identifying a computer does not guarantee that we know how to program it.
(3) Strategic knowledge involves knowledge of our own cognitive processes, including how learning and memory develop. It occurs quintessentially when we self-monitor our progress during any learning attempt. (4) Conditional knowledge is knowledge of or awareness of when our knowledge may be applied in ways that are context-appropriate. (5) Theoretical knowledge consists of our understanding of various explanatory connections regarding phenomena, cause and effect, and in-depth level relationships.

Although the five types of knowledge are frequently difficult in practice to separate, Haskell (2001) offers several reasons to support his assertion that declarative knowledge is the most crucial type for successful transfer: (a) declarative knowledge establishes the preconditions essential for the other four types; (b) the other four are either directly generated by or included in it; (c) a general framework for the assimilation of additional detailed new information is provided by it; (d) the elaboration of new information is frequently facilitated by it; and (e) helpful mental models to aid in grasping new information is often provided by it.

Transfer based on kinds of transfer. Haskell's (2001) second category for classifying kinds of transfer is predicated on the specific kind of transfer. According to Haskell, we should not infer that any of these fourteen specific kinds of transfer are inevitably mutually exclusive:

> (1) Content-to-content transfer, or declarative-to-declarative transfer, occurs when we utilize knowledge in one subject area in order to learn another area. More specifically, this kind of transfer implies two things: extant knowledge in a content area may expedite or interfere with routine learning, and new knowledge may be learned that is somewhat different from what was originally learned. Knowledge about triangles, squares, and circles from geometry, for example, can benefit one taking art classes.
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> (2) Procedural-to-procedural transfer, or skill-to-skill transfer, involves our applying procedures learned in a specific skill area to another skill area. Procedures in this context imply a sequence of actions. For example, skills derived from driving a car normally transfer to driving a truck.
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> (3) Declarative-to-procedural transfer helps us to actually do something because we have learned something about what ever it is we wish to do. For example,

knowledge about various types of mushrooms enables us to safely pick mushrooms in the wild.

(4) Procedural-to-declarative transfer enables us to acquire additional abstract knowledge about an area when we already have practical experience in that area. For example, practical experience in digging for fossils may help us in learning theoretical knowledge about paleontology.

(5) Strategic transfer occurs when we gain knowledge concerning our cognitive processes, such as learning and memory, by monitoring our cognitive activities while learning. Knowledge of our solution to one problem, for example, may transfer to the solution of another one.

(6) Conditional transfer enables us to decide when our knowledge regarding when to apply what we have learned in a specific context may be appropriate for its being transferred to another context. For example, knowledge about the basic trigonometric properties of triangles may be appropriate for solving vector problems in physics.

(7) Theoretical transfer occurs when we are able to transfer our in-depth understanding of cause and effect relationships in one area to another. For instance, a spectrum produced by a prism and a rainbow produced by sunlight and raindrops are the same.

(8) General or nonspecific transfer enables our past knowledge that is not specific to a training situation to be transferred to additional situations despite there being no conspicuous similarities between the past and the present situations. Knowledge about vectors in calculus will help in understanding meteorology.

(9) Literal transfer, a form of near transfer, entails the direct application of knowledge or procedures in a novel learning situation. In studying about diseases in biology you might learn that frequently washing your hands might enable you to avoid contracting the common cold, an airborne infectious respiratory disease. Then in studying about influenza, you might infer that frequently washing your hands might also help you to avoid contracting the flu.

(10) Vertical transfer is required whenever learning necessitates prerequisite skills. For example, skills at writing letters of the alphabet are useful to writing words.

(11) Lateral transfer occurs when we transfer past learning to the identical level in a knowledge hierarchy. Using the skills associated with driving a car to learn how to drive a truck is an example of lateral transfer.

(12) Reverse transfer, or backward transfer, involves modifying or reviewing our schemata relative to their similarities to novel information. This type of transfer essentially reverses the direction of how we typically perceive process transfer. For example, a student, confronted with a particular problem in economics, might specify its general demands, examine her/his repertoire, and realize that calculus can benefit her/him.

(13) Proportional transfer basically is a more abstract type of transfer. Recognizing the Golden Mean or Divine Proportion--the irrational number 1.618--in the various growth patterns of numerous things—for example, the spiral that shells form or the way a fern curves is an example.

(14) Relational transfer occurs when we perceive two things to be sharing the same structure, despite the lack of any underlying causal relationship. Mathematical analogies are frequently used to illustrate this type of transfer. A bat's wing and a whale's flipper are an example of what is referred to in biology as a homology, when two species' external appearance correspond in form despite having different underlying causal relationships.

In summary, two taxonomies for gauging transfer of learning were discussed: The first taxonomy focused on six levels of transfer, each of which specifies a precise degree of similarity between past and present knowledge. The second taxonomy elaborated on the kinds of transfer that occur and was divided into two constituent categories: (1) Which of five types of knowledge was transfer predicated on? (2) What was the specific kind of transfer, of which there are fourteen? Having outlined the basics for understanding the nature of transfer, understanding its importance to learning is in order.

The Importance of Transfer of Learning

Given the aforementioned analysis of transfer of learning, it is not surprising that both the functions of and the effects of transfer are equally pervasive. Everyday life is a constant reminder of how our reasoning is dependent upon transfer. Success is achieved in numerous facets of our daily lives, science, invention, and technology transfer, for example, primarily because of efficient transfer. We constantly perceive and interpret new things in light of our past experience. The advances and success in science, invention, and technology are frequently based on analogical reasoning, which is at the heart of transfer. These advances and successes sometimes generate new paradigms for viewing our world and represent our highest intellectual achievements. Indeed, learning from history per se requires transfer: analogizing past events and present situations. Hence, learning from history is transfer of learning par excellence.

In school, similarities, conceptually speaking, frequently exist within and across disciplines, so that transfer of learning opportunities abounds at the interdisciplinary levels. Moreover, it is now known that our knowledge base plays a central role in our cognitive processes (Anderson & Fincham, 1994). Researchers (Brown, Kane, & Long, 1989) have demonstrated that the absence of an appropriate knowledge base, not their developmental stage, is primarily responsible for young children's failure to transfer.

This study clearly showed that even children manifest competent analogical reasoning, provided they possess the pertinent knowledge base essential for grasping the analogical relationships. In addition, this research also demonstrated that children, like novices or non-experts, become perceptually bound only when they lack an adequate knowledge base.

Implications for Classroom Instruction

The current attempt to improve this nation's educational system by incorporating national standards and state standards and benchmarks is nothing short of revamping it. Each state is designing its own approach for transforming P-12 classroom instruction. No doubt, standards and benchmarks focusing on transfer of learning have been created within this new system at both the national and state levels. However, unless these various standards and benchmarks addressing transfer embrace Haskell's (2001) theoretical framework, less significant transfer and learning might materialize than otherwise would.

There are several major reasons for this assertion. First, standards and benchmarks need to articulate the degree of transfer being sought to enable us to perceive when, where, and how transfer evolves. Haskell's (2001) taxonomy of six levels of transfer accomplishes this by specifying the precise degree of similarity between past learning situations and present and future learning situations. Moreover, this dimension of transfer imposes order on the extent of transfer sought by minimizing or eliminating the overlap between various levels of transfer sometimes found in current standards and benchmarks.

Second, standards and benchmarks also need to specify the kind of transfer wanted as another method for perceiving how, when, and where transfer materializes. Haskell (2001) provides us with another taxonomy to meet this criterion for gauging transfer by classifying transfer into two fundamental categories: (1) the five different types of knowledge upon which transfer is predicated and (2) the distinct kind of transfer. Standards and benchmarks focusing on the first category compel students to generate as many meaningful connections between the type of knowledge addressed—declarative, procedural, strategic, conditional, and theoretical—and their own schemata. Generally, the number of future retrieval routes available for students is in proportion to the number of meaningful connections generated by them. In other words, the greater the number of similarities or analogical relationships that can be identified between past and present and future situations, the easier it will be for significant transfer of learning to occur. On the other hand, standards and benchmarks addressing the second category guide students in transferring their knowledge in one of fourteen specific ways. Moreover, this second category not only subsumes the first category's five ways to base transfer on knowledge but also specifies whether students are demonstrating near or far transfer.

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