

Transfer of Learning Transformed

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Instruction is motivated by the assumption that students can transfer their learning, or apply what they have learned in school to another setting. A common problem arises when the expected transfer does not take place, what has been referred to as the inert knowledge problem. More than an academic inconvenience, the failure to transfer is a major problem, exacting individual and social costs. In this article, I trace the evolution of research on the transfer of learning, in general, and on language learning, in particular. Then, a different view of learning transfer is advanced. Rather than learners being seen to “export” what they have learned from one situation to the next, it is proposed that learners *transform* their learning. The article concludes by offering some suggestions for how to mitigate the inert knowledge problem from this perspective.

Keywords transfer of learning; adaptation; iteration; affordances; complexity theory; second language learning; levels of processing framework; transfer appropriate processing

Introduction

A crucial assumption motivating instruction is that what students learn at one time and one place is available for them to use at another time and another place. In other words, students should be able to *transfer* what they have learned. Because this assumption undergirds all education, learning transfer, also called transfer of training and transfer of practice, has been the focus of much research for well over a century,¹ and it continues to inspire a great deal more.² The research has sought to answer the question why students often fail to transfer their learning, a failure termed the inert knowledge problem (Whitehead, 1929); students appear to have learned something at one time, but cannot activate it at another.

I am grateful for the comments of two anonymous referees and for the skillful organization and editing of my colleagues, Nick Ellis, Alister Cumming, and Lourdes Ortega.

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More than an academic inconvenience, the inert knowledge problem presents serious individual and social consequences. Language learners abandon their study of languages when they discover that they cannot utilize outside of the classroom that which they have worked so hard to attain within it. Employers complain that their new hires cannot perform tasks on the job that they should have learned in schools; schools counter that students have been taught how to do them. Especially distressing is the fact that the lack of transfer affects students discriminately, with lower income students being more affected by it than middle income students (Alexander, Entwisle, & Olson, 2001). Despite its serious consequences, there is little agreement among scholars about the nature of transfer, the extent to which it occurs, and its underlying mechanisms (Barnett & Ceci, 2002).

The present article argues that in order to understand transfer of learning with respect to language learning, researchers need to reframe the field's understanding of the problem: Language researchers need to see that transfer is not a matter of "exporting" an intact bit of knowledge from within the classroom to without or even of students' "reusing" what they have been taught, but rather of students' *transforming* what they have learned. While this shift in perspective does not solve the inert knowledge problem, it redirects attention to what students do rather than to what they don't do. When researchers and educators attend to what students are doing, they see not only that more transfer has taken place than they may have imagined, but also that what has been transferred has been transformed.

To contextualize the transformation of transfer, this *Language Learning* "current," I first describe types of transfer. I next trace the evolution of research that has attempted to understand and to measure transfer. I begin with cognitive factors. I then highlight three major themes in recent years: the importance of the learning context, the agency of learners, and the co-determination of learners and context. I continue with a transformative, ecological, dynamic account of transfer. I conclude by offering suggestions for how to mitigate the problem.

Types of Learning Transfer: Some Background³

Different taxonomies of transfer have been proposed (e.g., Barnett & Ceci, 2002; Royer, Mestre, & Dufresne, 2005). One common distinction made is between near and far transfer. Near transfer takes place between two similar contexts. An example would be a student's using a public computer at a library to do homework where the computer is of the same model and uses the same software as the computer the student uses at school. Far transfer occurs over two

widely separate contexts. An example is when someone skilled at chess uses the same strategies that were successful in chess to run a business (Perkins & Salomon, 1992). Far transfer is thought to be accomplished through analogical reasoning, and is considered the prototypical type of transfer; however, a problem with it is that students don't always see the connections between the two contexts (Helfenstein, 2005).

Teachers, under pressure to improve their students' performance on standardized examinations, sometimes teach to the test—an example of applying the strategy of teaching for near transfer, when, in fact, far transfer may be more important for students' future success (Barnett & Ceci, 2002). Of course, near transfer in language teaching can be important as well. For example, it is assumed that students are able to apply what they are learning in the second language classroom to their study of other school subjects when they are taught in the second language. The scope of far transfer has been extended beyond the ability to apply something learned in one setting to another to include the ability to solve novel problems that are isomorphs of one another, that is, those that share the same logical structure with the knowledge initially acquired, but which are presented or described in different terms. Even here, though, it has been found that only after receiving hints pointing out that two situations are isomorphic are students able to transfer relevant knowledge (Gick & Holyoak, 1983).

Salomon and Perkins (1989) dichotomized transfer somewhat differently. Rather than metaphorical distance, their low-road/high-road dichotomy relates to the amount of effort required. Low-road transfer involves the triggering of well-practiced routines by stimulus conditions similar to those in the learning context. Mindful or high-road transfer involves deliberate effortful abstraction and a search for connections. Accomplishing a transfer task can sometimes involve both.

In a theme familiar to those in second language (L2) learning, Butterfield and Nelson (1989, p. 5) added that teaching should not only promote positive transfer, but should also minimize negative transfer, the “learning” that adversely affects subsequent performance. Into the latter category would fall instances of pedagogically induced overgeneralization. Of course, researchers interested in second language learning are familiar with both the concepts of positive/negative transfer and of induced transfer of training errors (Selinker, 1972). In the L2 context, transfer is most often used to refer to cross-linguistic influence. This phenomenon is related to the matter under investigation in this article (and some who discuss general learning transfer include it); however, I will set it aside for my present purpose.⁴

Then, too, in first language (L1) acquisition, transfer has been invoked as an explanation for how it is that children are able to generalize from one syntactic structure to another. For example, Ninio (2011) argued that the learning curves of three types of basic verbal valence patterns show consistent acceleration, demonstrating the Power Law of Practice, the quantitative manifestation of transfer from previous learning. However, in this article, I will confine my exploration of transfer, or its lack, to what takes place from inside to outside the classroom and from one lesson to the next. This view of transfer, too, is well-known in second language circles. For instance, in one L2 study, students spent weeks practicing sentences with verbs in the progressive form, only to have that form disappear from classroom language when the next lesson introduced the simple present tense (Lightbown, 1983).

Cognitive Views of Transfer

The Inadequacy of Initial Learning

It would be easy to dismiss the lack of transfer to inadequate proper learning in the first place. Although establishing whether something has been learned or not is a vexing problem in L2 learning, “[w]ithout an adequate level of initial learning, transfer cannot be expected. The point seems obvious, but it is often overlooked” (Bransford, Brown, & Cocking, 1999, p. 41). Research in L2 skill learning supports this observation. For example, learners literate in their native language may not immediately transfer their reading comprehension strategies to the second language; they have to achieve a certain “threshold” of L2 knowledge: Clarke’s (1979) threshold hypothesis.

Some transfer researchers maintain that there is an equivalence between learning and transfer. However, Lobato (2003) noted that learning and transfer to a different time/place are conceptually distinguishable. She observed that learners can generalize what they have learned in a classroom to novel situations without any new learning taking place. This would be successful transfer. Of course, what draws most attention is where transfer is not successful. An example of unsuccessful transfer would be where a student shows certain grammar skills on a standardized multiple-choice language test given at school but does not apply them when communicating. Indeed, this phenomenon is precisely what I have referred to as Whitehead’s inert knowledge problem. In other words, talk of transfer is always at least implicitly contrastive: It assumes learning within a certain context and asks about its impact beyond that context (Perkins & Salomon, 1992).

Type of Processing

Anderson (1995) criticized earlier research on analogical transfer for its dominant focus on traits of the source and target in terms of declarative, instead of performance-oriented, processing. He pointed out that for skill acquisition declarative knowledge plays only a significant role initially and in the course of practice is replaced by procedural knowledge. However, with regard to language learning, DeKeyser (2007) observed that procedural knowledge may be too specific to be transferred from one skill to another, for example, from language production to language comprehension skills. Anderson's position would also be vulnerable to challenge from instance theorists (Truscott, 1998), who hold that learning and subsequent transfer is mainly a function of memory retrieval of representations of specific instances of language use (Logan, 1988), a view that is in clear contrast to the view of transfer as resulting from the efficiency of proceduralization (Helfenstein, 2005).

Craik and Lockhart (1972) also discussed types of processing. They offered what is known as the levels of processing framework explanation for why transfer might not occur. They hypothesized that retention will be affected by the type and depth of processing. Semantic processing of words will result in better transfer than if the words are processed more superficially, such as by their phonetic composition.

A number of studies appear to support the levels of processing framework, but Morris, Bransford, and Franks (1977) challenged this explanation. They manipulated levels of processing in word learning tasks and transfer tests in three experiments. Sentences were constructed containing target words that were either meaningful or not, or rhymed or did not. Essentially, the experiments showed that semantic processing was superior to rhyme processing, given a semantic recognition test, whereas rhyme processing was superior to semantic processing, given a rhyming recognition test. In other words, it is not that one form of processing is superior to another. Rather, it is that more effective transfer takes place when the type of processing correlates between the learning task and the transfer test. Their findings led them to call for replacing the concept of levels of processing with one emphasizing transfer-appropriate processing. Transfer appropriate processing rests on the idea that we can better remember what we have learned if the cognitive processes that are active during learning are similar to those that are active during retrieval (Blaxton, 1989; Lightbown, 2008). Thus, the most successful transfer is achieved when the retrieval conditions match, or have fidelity with, the conditions of learning (Franks, Bidrey, Lien, & McNamara, 2000).

Mismatch, of course, was a big criticism of the audiolingual language teaching method. Drilling students in language patterns might get students to produce the patterns accurately and fluently in the classroom, but when it came to students using the patterns in authentic communicative situations, the gap between the learning condition and the retrieval condition was too wide for successful transfer to take place. Students' knowledge remained inert.

Level of Abstraction

Rather than students' following a fixed set of procedures, such as an audiolingual drill, or their memorizing a set of facts, Bransford and Stein (1993) emphasized the importance of students learning with understanding. They contended that students who only follow fixed procedures or memorize facts have little basis for approaching a problem-solving task that differs in the slightest way from the original context. The National Research Council has adopted a similar position in its strong support for the benefits of helping students represent their experiences at levels of abstraction that transcend the specificity of particular contexts and examples, a teaching practice they call deeper learning (Pellegrino & Hilton, 2012).

Applying this logic to learning grammar, Larsen-Freeman (2000) has called for teaching reasons rather than, or in addition to, rules. Larsen-Freeman claimed that reasons are broader-based than rules, and that when students understand reasons why grammar structures are the way they are, their understanding, along with meaningful practice, helps students transcend the boundaries of a particular context. Then, too, De Palma and Ringer (2011) called attention to work by Smit (2004), who made a similar argument with regard to learning to write. Smit "distinguishes between broadly based and localized aspects of writing knowledge and ability: while broadly based aspects of writing do transfer from one writing context to another, localized aspects, because they are specific to particular contexts, do not" (De Palma & Ringer, 2011, p. 136). I will return to the issue of context-specific learning later.

When it comes to item learning, it appears that encountering frequent instances of a construction (i.e., tokens) is inadequate for abstraction. Frequency of tokens leads to stability and even entrenchment of the particular construction. Such is the case with the learning of the irregular past tense verbs in English, for example, where each irregular verb is acquired "locally," as a lexical item. However, with token variety within a type, that is, where different verbs are marked with the *-ed* for past tense, generalized abstract knowledge results and learners are able to use the past tense pattern productively, beyond the specific

regular verbs that they have already encountered (Bybee, 2008; Ellis, 2002; Eskildsen, 2012).

Active Construction, Schema, and Metacognition

With the introduction of constructivist learning theory, knowledge was not believed to transfer only due to commonalities across situations or tasks, but rather to result from learners' active construction of knowledge structures (Bruner, 1986). Learners were thought to construct schemata that organize large amounts of information into meaningful systems (Anderson, 1990). Cognitive schemata were then later used (transferred) during subsequent interactions.

In keeping with the discussion of higher order cognitive skills, a new theme was introduced into research in transfer: meta-cognition (Flavell, 1976; Brown, 1978). Different types of meta-cognitive skills, such as self-monitoring and self-regulation, were thought to facilitate learning and transfer. For instance, Soini (1999) counted among the preconditions for active transfer an individual's self-reflected management of knowledge.

It Is Not Just Cognition

Much of the research has been conducted with reference to cognitive knowledge and skills, such as analogical reasoning. However, cognitive transfer is inseparable from issues of emotion and motivation. Thagard and Shelley (2001) criticized the simplicity of analogical inference based on mere comparison of objects and properties and proposed a more complex model, their emotional coherence theory. Students do not only transfer what they know, but they also transfer the emotional valences of source elements to new targets (Helfenstein, 2005).

With regard to motivation, Pugh and Bergin (2006) discussed how motivational factors affect transfer by influencing the quality of initial learning, by promoting the cognitive engagement of learners, by influencing the initiation of transfer attempts, and by contributing to learner persistence. Then, too, learners of all ages are said to be more motivated to transfer when they can see the potential usefulness of what they are learning (Anderson, Simon, & Reder, 1996) and when they can use that information to do something that has an impact on others—especially their local community (Pintrich & Schunk, 2002). Despite these developments, Belenky and Nokes-Malach (2012) have recently asserted that the study of knowledge transfer still rarely draws upon motivational constructs in empirical work, and Perkins and Salomon (2012) have called for the reconciliation of the cognitive bases for transfer with motivational considerations.

Relating the issues of transfer and motivation to L2 acquisition, James (2012) studied L2 transfer motivation: a combination of effort, desire, and favorable attitudes determining students' intentions to transfer. James interviewed students enrolled in an English for academic purposes (EAP) writing course. He found that students' true motivation to transfer what they had learned in the writing course to other courses was rare, reinforcing the belief that transfer is hard to promote.

One of the issues that James's classroom-centered research raises is that so much of the transfer research has been conducted in laboratories, apart from natural learning environments (Lightbown, 2008). Bransford and Schwartz (1999) pointed out that transfer is often measured in sequestered problem solving (SPS) contexts, in which people complete tasks isolated from additional knowledge resources that are typically available in nonlaboratory settings. The researchers have questioned whether these decontextualized SPS assessments have ecological validity. This returns us to the matter of context.

Context

A cognitive understanding of transfer assumes that transfer is facilitated when what is learned in one situation is sufficiently abstract and decontextualized to apply to other situations. The basis for this assumption is that knowledge is separable from the context in which it is developed, rather than a function of activity, social interactions, culture, and history (Lobato, 2006).

Arguably, knowledge is not simply the individualized learning that students bring to and take from the classroom. Prior and subsequent knowledge also includes the kind of knowledge that learners acquire because of their social roles. Lave and Wenger (1991) argued that learning is situated; it occurs in a context and culture. Social interaction is a critical component of situated learning—learners learn what they do by participating in a community of practice (Lave & Wenger, 1991).

In keeping with this position, more recent views consider sociocultural influences on transfer (Beach, 1999). Transfer is not simply something an individual does in isolation, but rather depends on social and cultural factors. This dependence can be seen clearly in work done by Nasir (2000). She found that students who were very knowledgeable about basketball “street statistics” did not use their knowledge to make sense of statistics lessons in their classrooms. The statistics were analogous, but the students failed to see that. The cultural context of the two settings was so different that they supported different identities, roles, and interpretations of social demands.

But context dependence can be a problem for transfer, because transfer, by definition, has to occur when the original context of learning is not reinstated—when one is no longer in school, for example. Thus, if knowledge is too tightly bound to the context in which it was learned, transfer to superficially different contexts will be reduced significantly (Bjork & Richardson-Klavehn, 1989). In an attempt at reconciling the two views, Perkins and Salomon (1992) observed that general knowledge that works together with local knowledge is important for transfer.

Besides taking the context of learning into account, an important newer awareness in the study of transfer is the recognition that the learners' perspective needs to be considered.

The Agency of the Individual

It has been the case in much of the research that transfer success has been determined by how much what a student does corresponds with what the researcher expects the student to do. This normative definition of success obviates the need to look at what the student is actually doing when it departs from the researcher's expectations or from looking at the student's purposes and interpretation of the task. Indeed, a shortcoming of transfer research is that explanations rest on the judgment of the researcher or the characteristics of the learning material and situation instead of the perception of the individual engaged in transfer (Helfenstein, 2005), a practice which overlooks the mediating factors by which individuals activate and apply prior learning (Mestre, 2005).

The approaches I have been characterizing so far focus upon the knowledge and conditions of acquisition that optimize the chances of transfer from an etic or researcher's point of view, not an emic or learner's point of view. To remedy this oversight, Lobato (2003) advocated an "actor-oriented" transfer approach, which focuses on the processes by which learners form personal relations of similarities across situations, whether or not those connections are correct or normative, and on the specific ways in which the instructional environment affords and constrains learners' generalizations. By reanalyzing her data to look at how students see situations as similar, Lobato (2003) found significant evidence of transfer that had been overlooked in the initial etic analysis.

Thus, rather than asking whether transfer occurs, actor-oriented researchers ask what connections students are making. This question guides actor-oriented researchers to investigate how features of instructional environments, including the social nature of the setting, influence what students attend to and how in turn what they attend to affects how students generalize their learning experiences

(Lobato, Ellis, & Muñoz, 2003). However, Lobato, Rhodehamel, and Hohensee (2012) cautioned against an unfettered view of student agency. They advised that features in instructional contexts constrain the number of interpretations that are available for students to make.

James (2008) reported that ESL students' writing transfer was affected by the students' perception of the similarity between two tasks, not the researcher's task design, which used similar subject matter. Hansen (2000) also reported on an EAP student's skepticism regarding what she was learning in an EAP writing course, and Hansen suggested that this student's perception may well affect the transferability of what she was being taught. Experience tells us that a language teacher cannot take for granted that students will make connections between cognates. Many a second language instructor will assume that cognates are immediately recognizable by language learners, and that transfer is automatic in such cases, but experience suggests that this is not so (e.g., Zehr, 2011).

Individual Interacting With Context

The concept of transfer being the result of learning that is exported from one context to another is deficient in another way. This view ascribes to context the limited role of differentially supporting or interfering with transfer, so that context is not seen to be an actual part of the process (Beach, 2003). Earlier, Beach (1999) put it this way:

Historically, studies of transfer have located agency and explanation for the process along a Cartesian plane that cleaves individuals and social contexts. Individual agency is assumed to have little to do with the creation of social contexts supporting transfer, just as changes in contexts are presumed to have little to do with how individuals learn and develop across them. (pp. 102–103)

In contrast, Beach (1999) submitted that learners and contexts “exist in a recursive and mutually constitutive relation to one another across time” (p. 111). A similar argument is made in ecological psychology (Gibson, 1979/1986). From this perspective, knowledge is seen to be “an epiphenomenon of an agent interacting with an environment, in that knowledgeable behavior is co-determined by properties of the learner interacting on-the-fly with properties of the tools, information, and other learners available at the time” (Young, Kulikovich, & Barab, 1997, pp. 133–134). This position builds on Gibson's idea of affordances: the characteristics of the environment that support agents' contributions to interactive activity and, therefore, the characteristics of the environment that agents need to perceive.⁵

It was a concern for learners' being unable to perceive the environmental affordances (although I did not call it this) that led me to coin the term "grammaring" (Larsen-Freeman, 1995, 2003). I reasoned that a contributing cause to the inert knowledge problem, when it came to grammar instruction, was the confusion in students' minds stemming from learning grammar as a decontextualized body of knowledge, a static system of rules, rather than *experiencing* it as a dynamic system interacting with the environment, resulting from speakers' choices, which it is (Larsen-Freeman, 1997). In other words, a rule-bound conception of grammar might not make salient to learners any affordance in the context for transfer.

Greeno, Moore, and Smith (1993) adopted this position. While not ruling out the possibility of symbolic cognitive abstractions playing a role in transfer, they observed that transfer mediated in this way is atypical. Instead, they argued that it is less that transfer depends on mental representations of structure that the learner has acquired in initial learning and later applies in the transfer situation and more that during initial learning, the learner acquires invariant structures of activity (what they call action schemata) responsive to the affordances—the action opportunities—of the learning situation. If the potential transfer situation presents similar affordances and, *importantly*, the person recognizes them, 'the person may apply the same, or a somewhat adapted, action schema there. Thus, "in the affordance-activity view, the structure that enables transfer is in the interactive activity of the person in the situation" (Greeno et al., 1993, p. 146). When similar affordances are shared across different situations, there is the potential for transfer to occur (Day & Goldstone, 2012).

The Adaptive Value of Nontransfer

I have been careful to use the word "mitigate," not "solve," in conjunction with the inert knowledge problem. One of the reasons for my caution (besides the complexity of the issue and the nascence of our understanding) is that the problem may be inevitable. Bjork (2011) pointed out that there are times when it is not to our advantage to remember what we have learned. While our capacity for remembering is almost limitless, our capacity for retrieval is not. This is not necessarily a bad thing. For instance, we may not want phone numbers we have learned in the past to be easily accessible. Instead, we want our memories to be "updated," where previously stored information is sometimes inhibited. Retrieval inhibition, according to Bjork, is an adaptive mechanism in human memory. It does not result in the permanent loss of memories, but rather they become less accessible because other items interfere or get in the way. "Thus,

retrieval-induced forgetting is the consequence of an adaptive mechanism that facilitates remembering by causing forgetting” (Storm, 2011, p. 292).⁷

It is perhaps inevitable, therefore, that although the potential for transfer of some previous learning is present on a given occasion, it is not activated because of retrieval inhibition. This may explain the waxing and waning of patterns used by L2 learners (Ellis & Larsen-Freeman, 2006; Larsen-Freeman, 2006). At any one point in time, from a target-language perspective, regress is as much a part of the language-learning process as is progress (de Bot & Schrauf, 2009). It is also important to note that thoughts of “regress” and “progress” are consistent with a view of language learning as a telic process. In the absence of a target-centric perspective, the waxing and waning of language-using patterns might be more appropriate as a focus of scholarly inquiry and less a matter of concern. This same focus motivates a need to reframe the overall understanding of transfer, for researchers have yet to look closely at what is being transferred.

Reframing the Understanding of Transfer: Transformation

A problem that I have hinted at, but have not yet fully articulated, is that the term transfer suggests that “the tasks or situations across which transfer occurs remain unchanged during the transfer and that the ‘transferor’ reproduces existing relations between fixed tasks” (Lobato, 2006, p. 444). Indeed, as I have shown, explanations for transfer are based on the psychological invariance of mental representations and action schemata.

This assumption of invariance runs contrary to what Carraher and Schliemann (2002) found when studying what students did to solve a mathematical problem (2002):

They have not simply unloaded a prior solution from their storehouse of knowledge. They have crafted it on the spot, adjusting and adapting their prior knowledge in the process. It is precisely this active accommodation of knowledge to the demands of the situation (as understood by them) that so notably lacks in transfer accounts of learning. (p. 18)

In other words, Carraher and Schliemann rejected the notion of transfer in its passive “carrying over” sense (p. 19). This transportation metaphor, that learners carry over knowledge from one situation to another, is problematic for several reasons. First, the transfer process itself is likely to be much more dynamic, one in which students construct, rather than carry over their knowledge to the new situation (Rebello, Cui, Bennett, Zollman, & Ozimek, 2007). Closely related is the second reason: There is no room in earlier accounts of transfer for

the possibility that the knowledge acquired in the classroom is transformed. We know from a consideration of language as a complex adaptive system (Ellis & Larsen-Freeman, 2009), it is in using language that it is transformed. The transformation is partly due to the learner's interacting with a different and changing context and partly due to internal reorganization of the learner's language resources. Transformation is an optimizing process whereby learners alter their language resources to adapt to a changing environment or their changing goals. According to Spivey (2007), this entails dropping "the assumption of stable symbolic internal representations (holdovers from an information-processing perspective on cognitive processes) . . . continuing on to a fully ecological dynamical account of perception, cognition, and action that connects the brain, body, and world" (p. 332).

In L2 writing, De Palma and Ringer (2011) construed transfer as a dynamic process, not only centered on how students apply, but also on how they reshape, L2 writing skills they have learned in prior contexts to fit new ones. They referred to this phenomenon as adaptive transfer: "Rather than viewing students as novice writers, adaptive transfer allows for students to be perceived as agents who possess a variety of language resources and a range of knowledge bases that they might draw on in each writing context" (p. 142). A similar claim was advanced by Macqueen (2009). Applying a complexity theory perspective to analyzing students' writing in a second language, Macqueen highlighted the process of adaptive imitation. In the gradual process of developing the means of participation in an English-speaking speech community, the participants in her study adapted lexicogrammatical patterns in their writing to suit their changing goals.

From a complexity theory perspective the crucial point is that linguistic knowledge is not *given or transferred* but adaptively *achieved* by the individual in the environment (Leather & van Dam, 2003). What this means is that language is not located exclusively in the brain, in the body, in the environment, or in a particular linguistic form: It is latent and becomes manifest only as a function of the global state of the system, which emerges in the interaction (Varela, Thompson, & Rosch, 1991; see also Atkinson, 2011; Larsen-Freeman & Cameron, 2008).

Applications

By reframing our understanding of transfer as transformed, the claim is that learners transform what they are taught in the classroom; they do not merely implement or repeat it. This is true of low-road transfer as much as high-road. Indeed, the very process of retrieval consolidates (Karpicke & Roediger, 2008)

and modifies what has been learned (Bjork, 2011); moreover, exact repetition never takes place.

The failure to transfer as it has been traditionally understood may be unavoidable; nevertheless, teachers must teach as if this is not the case. Therefore, before concluding, I speculate on several teaching practices and conditions that might mitigate the inert knowledge problem (see also Bransford et al., 1999; James, 2006; Lightbown, 2008).

Psychological Authenticity

For transfer appropriate processing to take place, it is important for students to engage in activities that are rich with affordances and that have psychological authenticity.⁸ To increase the fidelity between situations of learning and retrieval, students should have a genuine need to successfully receive and convey the information at the core of the communication. Further, learners need to engage in the kinds of cognitive processing that include establishing joint attention, reading communicative intentions, processing perspective/construal, and so on, because it is these aspects of L2 processing that will need to be transferred to other communicative settings (Segalowitz & Trofimovich, 2012).

In addition, classroom activities should be designed to allow learners to experience some of the normal psychological pressures and social interaction felt by people engaged in real communication (Gatbonton & Segalowitz, 1988), modulated for their proficiency level (Larsen-Freeman, 2003). Along similar lines, Bjork suggested that the most effective instruction introduces “desirable difficulties” into classroom learning (Bjork & Linn, 2006).

Language Use as Choice

“A complex systems view . . . foregrounds the centrality of variation among different speakers and their developing awareness of the choice they have in how they use patterns within a social context” (Larsen-Freeman & Cameron, 2008, p. 116). Of course, Halliday (1994) has long discussed language as a system of choices, and I have written about grammaring as choice-making (Larsen-Freeman, 2002). Consistent with this assumption is that what is taught in the first place should not be language as a single homogenous idealized construct, but rather as a system of variable, mutable, language-using patterns (Larsen-Freeman & Cameron, 2008).

Reminding

Earlier, I mentioned that students do not always transfer from one situation to another on their own initiative. They need hints or reminding (Benjamin,

2011) to do so. Reed (2012) reported on research that suggests a manifold increase in transfer when students are given a hint to use previous information to come up with a solution to a new problem (from 8% to over 50%), but this should be tempered with James's (2009) sobering report that when ESL students were asked to find the similarities between a task and work they were doing in their writing course, they did not demonstrate transfer any more than students who were not asked to search for similarities.

Yet, a critical requirement for transfer is that students attend to the dimensions relevant to the solution of the new problem (Detterman, 1993). Of course, teachers are not always going to be present to remind students to think back to a specific similar example to solve a current problem. Engle (2006), therefore, made a case for framing discussions with learners to enhance transfer. Learners need to understand "that what they are currently doing is part of a larger intellectual conversation that extends across time" (p. 457), a framing that creates "intercontextuality."

Calling Attention to Difference

A lot of attention has been given in this article to common or similar features between occasions of learning and of transfer. However, Marton (2006) maintained that it is the contrasts that matter: "In order for the learner to perceive similarity, the learner must also have previously experienced something it differs from. Seeing one thing affects how the learner sees another thing—not because of the sameness of the two, but because of both similarities and difference" (pp. 531–532). He illustrated his point in discussing the learning of Cantonese tones. According to Marton, "[a]lthough the sameness of the sounds across the two words was a necessary condition for discerning the tone, it was the difference—and not the sameness—that was attended to, discerned, and transferred" (p. 529).

Iteration

One way to help learners notice similarities and differences is to present students with slightly varied consecutive activities in which students must enact their language-using resources iteratively (Larsen-Freeman, in press a). Iteration, or the opportunity to revisit the same territory again and again, is different from repetition; it is the former that is important for language learning and for transfer. "Teaching for transfer then involves returning again and again to an idea or procedure on different levels and in different contexts . . . , with what appears to be different examples. But from a transfer perspective, 'different examples' are but variations on a single idea or concept" (Haskell, 2001, p. 214).

Adaptation

Larsen-Freeman (in press b) also proposes that what should be taught is not only language, but also the process of adaptation: Teaching students to take their present system and mold it to a new and changing context for a present purpose. Learners transform their knowledge; they don't merely implement knowledge in the form in which it was delivered through instruction, and this happens at all levels of language proficiency.

Thus, a unified view of context and learner lies in the recognition that giving learners an opportunity to do something a little bit different each time they engage in a particular activity is good training not only for perceiving difference, but also for being able to make the adaptations they need when faced with a different context or task. At a product level, this also means teaching variants—going from teaching one form = one meaning to one meaning = many forms, and at the process level, teaching adaptation as a process (with feedback).

Such practice is not about rehearsal or “transferring intact knowledge.” Iteration and adaptation are critical components not only of learning in the classroom, but also of mobilizing learning beyond the classroom. After all, second language acquisition is not a matter of conformity to uniformity (Larsen-Freeman, 2003), and language is not fixed, but is rather a dynamic system (Larsen-Freeman, 1997).

Conclusion

In this article, I have traced developments in the evolution of thinking about learning transfer. My starting point was cognitive,⁹ followed by emotional, motivational, contextual, individual, interactional, and transformational views. One could make the case that this sequence also characterizes the evolution of research in the field of second language learning overall. Of course, although I have treated developments more or less chronologically, much productive work is being done in each of these areas today. Nevertheless, it seems to me that the latest view, one that understands transfer not as the reuse of past learning, but rather its transformation, shows great promise, and is a worthy current in language learning—though surely and happily, the currents will continue to flow.

Revised version accepted 4 September 2012

Notes

- 1 Thorndike and Woodworth (1901) concluded that where specific training in one task seemed to cause improvement in learning another, the improvement could be

- attributed to common elements in the two exercises. This “common elements” claim has spurred much of the transfer research over the decades since, although the nature of the elements has changed.
- 2 The U.S. National Science Foundation thought enough about the issue of transfer to convene two symposia within two years of each other, to which some of the leading contributors of research on transfer were invited to participate (see edited collections by Mestre, 2002 and Lobato, 2004), and just this year, special issues of the *Journal of the Learning Sciences* and *Educational Psychologist* have been dedicated to learning transfer.
 - 3 Because it has been studied for a long time and because it has received a great deal of attention (e.g., “There is perhaps no more important topic in the psychology of learning than transfer of learning,” Ellis, 1965, p. 5), the review is highly selective. I am also aware that when reviewing the literature on transfer, what is discussed as being transferred is not always the same. For instance, in this review, sometimes it is “items” or “constructions”; other times it is a skill or some subject matter.
 - 4 Perhaps one point is worth noting: In his dissertation on transfer, Helfenstein (2005, p. 34) gave L2 interlanguage research credit for the reciprocal view on transfer between source and target. Not only can past experiences influence present ones, but current activities can alter the quality of previously acquired skills and memories.
 - 5 See van Lier (2000) for a discussion of affordances and language learning.
 - 6 Indeed, in a recent *New York Times* article (March 17, 2012), Albert Costa of the University of Pompea surmises that an advantage that bilinguals enjoy over monolinguals may be their heightened ability to monitor the environment.
 - 7 On a more positive note, memories no longer easily accessible, due to competition from other memories, are still available and may be relearned at an accelerated rate (Bjork, 2011).
 - 8 One practice this perspective might suggest is to give students more authentic experiences in the classroom so that the distance between the classroom and the outside world is not so wide, for example, turning the classroom into a market, for instance, in order to practice the language of shopping. While simulating the “outside world” in the classroom may have motivational appeal, it is not very practical. Besides, it seems to me “[t]he central question is not what learners have to do to use language naturally, but what they have to do to learn to use language naturally” (Widdowson, 1990, pp. 46–47).
 - 9 I could have started earlier, for example, with behaviorism (e.g., Osgood, 1949).

References

- Alexander, K. L., Entwisle, D. R., & Olson, L. S. (2001). Schools, achievement, and inequality: A seasonal perspective. *Educational Evaluation and Policy Analysis*, 23, 171–191.
- Anderson, J. R. (1990). *The adaptive character of thought*. Hillsdale, NJ: Lawrence Erlbaum.

- Anderson, J. R. (1995). *Learning and memory*. New York: Wiley.
- Anderson, J. R., Simon, H. A., & Reder, L. M. (1996). Situated learning and education. *Educational Researcher*, 25(4), 5–11.
- Atkinson, D. (Ed.). (2011). *Alternative approaches to second language acquisition*. London: Routledge.
- Barnett, S., & Ceci, S. J. (2002). When and where do we apply what we learn? A taxonomy for far transfer. *Psychological Bulletin*, 128, 612–637.
- Beach, K. D. (1999). Consequential transitions: A sociocultural expedition beyond transfer in education. *Review of Research in Education*, 28, 101–139.
- Beach, K. D. (2003). Consequential transitions: A developmental view of knowledge propagation through social organizations. In T. Tuomi-Gröhn & Y. Engeström (Eds.), *Between school and work: New perspectives on transfer and boundary-crossing* (pp. 39–62). Oxford, UK: Elsevier Science.
- Belenky, D. M., & Nokes-Malach, T. J. (2012). Motivation and transfer: The role of mastery-approach goals in preparation for future learning. *Journal of the Learning Sciences*, 21, 399–432.
- Benjamin, A. S. (Ed.). (2011). *Successful remembering and successful forgetting: A festschrift in honor of Robert A. Bjork*. New York: Taylor and Francis.
- Bjork, R. A. (2011). On the symbiosis of learning, remembering, and forgetting. In A. S. Benjamin (Ed.), *Successful remembering and successful forgetting: A Festschrift in honor of Robert A. Bjork* (pp. 1–22). London: Psychology Press.
- Bjork, R. A., & Linn, M. C. (2006). The science of learning and the learning of science: Introducing desirable difficulties. *American Psychological Society Observer*, 19, 29, 39.
- Bjork, R. A., & Richardson-Klavehn, A. (1989). On the puzzling relationship between environmental context and human memory. In C. Izawa (Ed.), *Current issues in cognitive processes: The Tulane Flowerree Symposium on Cognition* (pp. 313–344). Hillsdale, NJ: Lawrence Erlbaum.
- Blaxton, T. A. (1989). Investigating disassociations among memory measures: Support for a transfer-appropriate processing framework. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 15, 657–668.
- Bransford, J. D., Brown, A., & Cocking, R. (Eds.). (1999). *How people learn: Brain, mind, experience, and school*. Washington, DC: National Academies Press.
- Bransford, J. D., & Schwartz, D. L. (1999). Rethinking transfer: A simple proposal with interesting applications. *Review of Research in Education*, 24, 61–100.
- Bransford, J. D., & Stein, B. S. (1993). *The IDEAL problem solver* (2nd ed.). New York: Freeman.
- Brown, A. L. (1978). Knowing when, where, and how to remember: A problem of metacognition. In R. Glaser (Ed.), *Advances in instructional psychology* (Vol. 1, pp. 77–165). Hillsdale, NJ: Lawrence Erlbaum.
- Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18(1), 32–42.

- Bruner, J. (1986). *Actual minds, possible worlds*. Cambridge, MA: Harvard University Press.
- Butterfield, E., & Nelson, G. (1989). Theory and practice of teaching for transfer. *Educational Technology Research and Development*, 3, 5–38.
- Bybee, J. (2008). Usage-based grammar and second language acquisition. In P. Robinson & N. C. Ellis (Eds.), *Handbook of cognitive linguistics and second language acquisition* (pp. 216–236). London: Routledge.
- Carraher, D., & Schliemann, A. D. (2002). The transfer dilemma. *Journal of the Learning Sciences*, 11, 1–24.
- Clarke, M. (1979). Reading in Spanish and English: Evidence from adult ESL students. *Language Learning*, 29, 121–150.
- Craik, F., & Lockhart, R. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior*, 11, 671–684.
- Day, S. B., & Goldstone, R. L. (2012). The import of knowledge export: Connecting findings and theories of transfer of learning. *Educational Psychologist*, 47, 153–176.
- de Bot, K., & Schrauf, R. (2009). *Language development over the lifespan*. London: Routledge.
- DeKeyser, R. (Ed.). (2007). *Practice in a second language*. Cambridge, UK: Cambridge University Press.
- De Palma, M.-J., & Ringer, J. M. (2011). Toward a theory of adaptive transfer: Expanding disciplinary discussions of “transfer” in second-language writing and composition studies. *Journal of Second Language Writing*, 20, 134–147.
- Detterman, D. K. (1993). The case for the prosecution: Transfer as an epiphenomenon. In D. K. Detterman & R. J. Sternberg (Eds.), *Transfer on trial: Intelligence, cognition, and instruction* (pp. 1–24). Norwood, NJ: Ablex.
- Ellis, H. C. (1965). *The transfer of learning*. New York: Macmillan.
- Ellis, N. C. (2002). Frequency effects in language processing: A review with implications for theories of implicit and explicit language acquisition. *Studies in Second Language Acquisition*, 24, 143–188.
- Ellis, N. C., & Larsen-Freeman, D. (Eds.). (2006). Language emergence: Implications for applied linguistics [Special Issue]. *Applied Linguistics*, 27(4).
- Ellis, N. C., & Larsen-Freeman, D. (Eds.). (2009). Language as a complex adaptive system [Special issue]. *Language Learning*, 59(Supplement 1).
- Engle, R. A. (2006). Framing interactions to foster generative learning: A situative account of transfer in a community of learners classroom. *Journal of the Learning Sciences*, 15, 451–498.
- Eskildsen, S. (2012). L2 negation constructions at work. *Language Learning*, 62, 335–372.
- Flavell, J. (1976). Metacognitive aspects of problem solving. In L. Resnick (Ed.), *The nature of intelligence* (pp. 231–236). Hillsdale, NJ: Lawrence Erlbaum.

- Franks, J., Bibrey, C., Lien, K., & McNamara, T. (2000). Transfer-appropriate processing (TAP) and repetition priming. *Memory & Cognition*, 28, 1140–1151.
- Gatbonton, E., & Segalowitz, N. (1988). Creative automatization: Principles for promoting fluency within a communicative framework. *TESOL Quarterly*, 22, 473–492.
- Gibson, J. J. (1979/1986). *The ecological approach to visual perception*. Hillsdale, NJ: Lawrence Erlbaum.
- Gick, M. L., & Holyoak, K. J. (1983). Schema induction and analogical transfer. *Cognitive Psychology*, 15, 1–38.
- Greeno, J. G., Smith, D. R., & Moore, J. L. (1993). Transfer of situated learning. In D. K. Detterman & R. J. Sternberg (Eds.), *Transfer on trial: Intelligence, cognition, and instruction* (pp. 99–167). Norwood, NJ: Ablex.
- Halliday, M. A. K. (1994). *An introduction to functional grammar* (2nd ed.). London: Edward Arnold.
- Hansen, J. G. (2000). Interactional conflicts among audience, purpose, and content knowledge in the acquisition of academic literacy in an EAP course. *Written Communication*, 17, 27–52.
- Haskell, R. A. (2001). *Transfer of learning*. San Diego, CA: Academic Press.
- Helfenstein, S. (2005). *Transfer: Review, reconstruction, and resolution*. Unpublished doctoral dissertation, University of Jyväskylä.
- James, M. A. (2006). Teaching for transfer in ELT. *ELT Journal*, 60, 151–159.
- James, M. A. (2008). The influence of perceptions of task similarity/difference on learning transfer in second language writing. *Written Communication*, 25, 76–103.
- James, M. A. (2009). “Far” transfer of learning outcomes from an ESL writing course: Can the gap be bridged? *Journal of Second Language Writing*, 18, 69–84.
- James, M. A. (2012). An investigation of motivation to transfer second language learning. *Modern Language Journal*, 96, 51–69.
- Karpicke, J., & Roediger, H. (2008). The critical importance of retrieval for learning. *Science*, 319, 966–968.
- Larsen-Freeman, D. (1995). On the teaching and learning of grammar: Challenging the myths. In F. Eckman, D. Highland, P. Lee, J. Mileham, & R. Rutkowski Weber (Eds.), *Second language acquisition theory and pedagogy* (pp. 131–150). Mahwah, NJ: Lawrence Erlbaum.
- Larsen-Freeman, D. (1997). Chaos/complexity science and second language acquisition. *Applied Linguistics*, 18, 141–165.
- Larsen-Freeman, D. (2000). Rules and reasons in grammar teaching. *ESL Magazine*, January/February.
- Larsen-Freeman, D. (2002). The grammar of choice. In E. Hinkel & S. Fotos (Eds.), *New perspectives on grammar teaching* (pp. 103–118). Mahwah, NJ: Lawrence Erlbaum.
- Larsen-Freeman, D. (2003). *Teaching language: From grammar to grammaring*. Boston: Heinle/Cengage.

- Larsen-Freeman, D. (2006). The emergence of complexity, fluency, and accuracy in the oral and written production of five Chinese learners of English. *Applied Linguistics*, 27, 590–619.
- Larsen-Freeman, D. (in press a). On the roles of repetition in language teaching and learning. *Applied Linguistics Review*.
- Larsen-Freeman, D. (in press b). Complex systems and technemes. In J. Arnold & T. Murphey (Eds.), *Meaningful action: Earl Stevick's influence on language teaching*. Cambridge, UK: Cambridge University Press.
- Larsen-Freeman, D., & Cameron, L. (2008). *Complex systems and applied linguistics*. Oxford, UK: Oxford University Press.
- Lave, J. (1988). *Cognition in practice: Mind, mathematics, and culture in everyday life*. Cambridge, UK: Cambridge University Press.
- Lave, J., & Wenger, F. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge, UK: Cambridge University Press.
- Leather, J., & van Dam, J. (Eds.) (2003). *Towards an ecology of language acquisition*. Dordrecht: Kluwer Academic Publishers.
- Lightbown, P. M. (1983). Exploring relationships between developmental and instructional sequences in L2 acquisition. In H. Seliger & M. Long (Eds.), *Classroom oriented research in second language acquisition* (pp. 217–243). Rowley, MA: Newbury House.
- Lightbown, P. M. (2008). Transfer appropriate processing as a model for classroom second language acquisition. In Z.-H. Han (Ed.), *Understanding second language process* (pp. 27–44). Clevedon, UK: Multilingual Matters.
- Lobato, J. (2003). How design experiments can inform a rethinking of transfer and vice versa. *Educational Researcher*, 32(1), 17–20.
- Lobato, J. (2004). *An international working conference: Addressing the transfer dilemma*. Unpublished proposal REC- 0450208 funded by the National Science Foundation. Department of Mathematics and Statistics, San Diego State University.
- Lobato, J. (2006). Alternative perspectives on the transfer of learning: History, issues, and challenges for future research. *Journal of the Learning Sciences*, 15, 431–449.
- Lobato, J., Ellis, A. B., & Muñoz, R. (2003). How “focusing phenomena” in the instructional environment afford students’ generalizations. *Mathematical Thinking and Learning*, 5(3), 1–36.
- Lobato, J., Rhodhamel, B., & Hohensee, C. (2012). “Noticing” as an alternative transfer of learning process. *Journal of the Learning Sciences*, 21, 433–482.
- Logan, G. (1988). Toward an instance theory of automatization. *Psychological Review*, 95, 492–527.
- Macqueen, S. (2009). *The emergence of patterns in second language writing. A sociocognitive exploration of lexical trails*. Unpublished doctoral dissertation, University of Melbourne.
- Marton, F. (2006). Sameness and difference in transfer. *Journal of the Learning Sciences*, 15, 499–535.

- Mestre, J. (2002). Transfer of learning: Issues and research agenda (No. NSF03–212). Arlington, VA: National Science Foundation.
- Mestre, J. (Ed.). (2005). *Transfer of learning from a modern multidisciplinary perspective*. Greenwich, CT: Information Age.
- Morris, D. D., Bransford, J. D., & Franks, J. J. (1977). Levels of processing versus transfer appropriate processing. *Journal of Verbal Learning and Verbal Behavior*, *16*, 519–533.
- Nasir, N. (2000). Points ain't everything: Emergent goals and average and percent understandings in the play of basketball of African-American students. *Anthropology and Education Quarterly*, *31*, 283–305.
- Ninio, A. (2011). *Syntactic development, its input and output*. Oxford, UK: Oxford University Press.
- Osgood, C. (1949). The similarity paradox in human learning: A resolution. *Psychological Review*, *56*, 132–143.
- Pellegrino, J. W., & Hilton, M. L. (Eds.). (2012). *Education for life and work: Developing transferable knowledge and skills for the 21st century*. A report of the National Research Council. Washington, DC: National Academies Press.
- Perkins, D., & Salomon, G. (1992). Transfer of learning. *International encyclopedia of education* (2nd ed.). Oxford, UK: Pergamon Press.
- Perkins, D. N., & Salomon, G. (2012). Knowledge to go: A motivational and dispositional view of transfer. *Educational Psychologist*, *47*, 248–258.
- Pintrich, P. R., & Schunk, D. H. (2002). *Motivation in education: Theory, research and applications* (2nd ed.). Upper Saddle River, NJ: Merrill/Prentice-Hall.
- Pugh, K. J., & Bergin, D. A. (2006). Motivational influences on transfer. *Educational Psychologist*, *41*, 147–160.
- Rebello, N. S., Cui, L., Bennett, A. G., Zollman, D. A., & Ozimek, D. J. (2007). Transfer of learning in problem solving in the context of mathematics and physics. In D. H. Jonassen (Ed.), *Learning to solve complex scientific problems* (pp. 223–246). Hillsdale, NJ: Lawrence Erlbaum.
- Reed, S. K. (2012). Learning by mapping across situations. *Journal of the Learning Sciences*, *21*, 353–398.
- Royer, J., Mestre, J., & Dufresne, R. (2005). Framing the transfer problem. In J. Mestre (Ed.), *Transfer of learning from a modern multidisciplinary perspective* (pp. vii–xxvi). Greenwich, CT: Information Age.
- Salomon, G., & Perkins, D. (1989). Rocky roads to transfer: Rethinking mechanisms of a neglected phenomenon. *Educational Psychologist*, *24*, 113–142.
- Segalowitz, N., & Trofimovich, P. (2012). Second language processing. In S. Gass & A. Mackey (Eds.), *Handbook of second language acquisition* (pp. 179–192). London: Routledge.
- Selinker, L. (1972). Interlanguage. *International Review of Applied Linguistics*, *10*, 209–231.

- Singley, M. K., & Anderson, J. R. (1989). *The transfer of cognitive skill*. Cambridge, MA: Harvard University Press.
- Smit, D. W. (2004). *The end of composition studies*. Carbondale: Southern Illinois University Press.
- Soini, T. (1999). *Preconditions of active transfer*. Unpublished doctoral dissertation, Helsinki University.
- Spivey, M. (2007). *The continuity of mind*. Oxford, UK: Oxford University Press.
- Storm, B. (2011). The benefit of forgetting in thinking and remembering. *Current Directions in Psychological Science*, 20, 291–295.
- Thagard, P., & Shelley, C. (2001). Emotional analogies and analogical inference. In D. Gentner, K. Holyoak, & B. Kokinov (Eds.), *The analogical mind: Perspectives from cognitive science* (pp. 335–362). Cambridge, MA: MIT Press.
- Thorndike, E. L., & Woodworth, R. S. (1901). The influence of improvement in one mental function upon the efficiency of other functions. *Psychological Review*, 8, 247–261.
- Truscott, J. (1998). Instance theory and universal grammar in second language research. *Second Language Research*, 14, 257–291.
- van Lier, L. (2000). From input to affordances. In J. Lantolf (Ed.), *Sociocultural theory and second language learning* (pp. 245–260). Oxford, UK: Oxford University Press.
- Varela, F., Thompson, E., & Rosch, E. (1991). *The embodied mind: Cognitive science and human experience*. Cambridge, MA: MIT Press.
- Whitehead, A. N. (1929). *The aims of education*. New York: Macmillan.
- Widdowson, H. W. (1990). *Aspects of language teaching*. Oxford, UK: Oxford University Press.
- Young, M., Kulikovich, J., & Barab, S. (1997). The unit of analysis for situated assessment. *Instructional Science*, 25, 133–150.
- Zehr, M. (2011). Teacher: Transfer from first language to English isn't automatic. *Education Week's Blogs*, June 15.