# Mind Blocks

Lance Knowles explains how Recursive Hierarchical Recognition, a brain-based theory of language acquisition, is shaping the design of computer-assisted learning materials
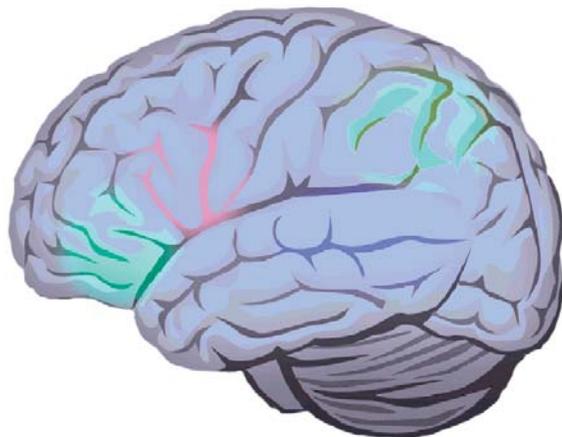
Figure 1
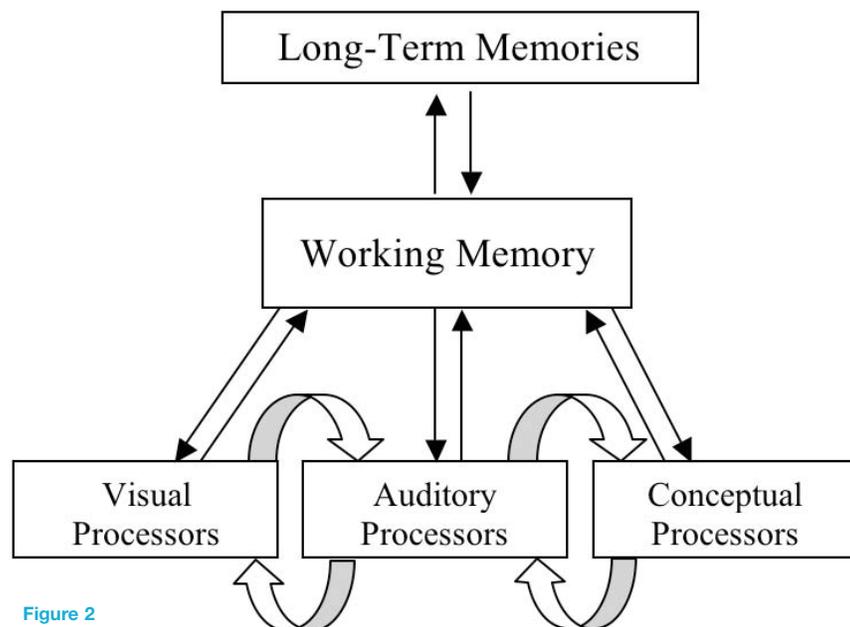
Figure 2

Research in neuroscience underscores the importance of neuroplasticity, iconic representation, repetition, and the role of media-rich input in skill acquisition. It suggests how different pathways in the brain work together, and how sequenced, coordinated inputs facilitate long-term learning.

Recursive Hierarchical Recognition (RHR) is an evolving brain-based learning theory based on teaching experience, neuroscience research, and access to the study records of thousands of students studying in diverse circumstances around the world. Some of the theory overlaps with previous language learning approaches, but there is no space here to go into comparisons.

At the outset, RHR assumes that language acquisition is first and foremost a skill-acquisition process. Drawing on neuroscience research, it defines what this means and suggests ways to design activities to facilitate the neural processing that is involved in language acquisition. It also presents a means for sequencing, monitoring, and measuring the effectiveness of language practice activities. This paper summarizes a few of the key concepts that are at the root of the theory.

The Traditional Approach
In most countries around the world, students study languages in a similar way. In class, the teacher presents and explains vocabulary and grammar. There are textbooks, and there is a heavy use of text even to teach listening. Teachers write words and questions on the board or show the words with flash cards. And students sit and listen and do very little communicating in the target language. They listen, repeat, and try to memorize, but with few repetitions. Or they look at text, read, and try to memorize words and sentences. In general, what they don't get enough of is actual language practice, especially listening and speaking. As a result, most students don't develop their oral skills, which are the foundation for reading and writing.

This traditional approach to language learning is knowledge-based. The teacher is the giver of knowledge about the language, rather than a coach who helps students to practice it.

The Demands of Fluency
What is missing in the traditional approach is the kind of practice necessary to develop automaticity, in particular the skill to automatically process and chunk language, where chunking means to recognize and process groups of words rather than discrete items. RHR recognizes that the size and semantic complexity of the chunks that can be processed is proportional to fluency. Memory required to store and process spoken language is limited to a small number of chunks; so if chunks are too small, spoken language input cannot be processed quickly enough.

RHR develops chunking skill. At the word level, groups of words are built around concepts, which express elements of information, and language functions, which signal the type of speech act (e.g. request, suggestion). Examples of concepts include: point of time (when he arrived), frequency (several times a week), and events (the car went off the road).

In RHR, teaching discrete words is avoided. Instead lexical items are presented in phrases, such as 'a book', 'a red book', 'a green book,' 'open the red book', etc. Presenting vocabulary in this way facilitates conceptual chunking while also teaching the vocabulary.

So, a major challenge for the language learner is to develop the skill of chunking.

From neuroscience, skill acquisition means to develop procedural memory, which is distinct from the brain's 'event' or 'declarative' memory [Ulman]. Procedural memories, which are unconscious, are primarily developed through frequent and repeated practice. Appropriate sequencing is also important, and in RHR chunking practice begins with