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On the Cusp: New Developments in Language Teaching

This is an exciting time in the field of language teaching. Yet many ESL/EFL professionals are either unaware of or remain indifferent to developments in other fields that are of fundamental importance to language teaching, such as the evolving role of computer assisted language teaching (CALL) and recent learning theories based on neuroscientific studies. New areas of research outside the profession have barely made a dent in how ESL/EFL teachers and academics approach the classroom and materials development, while language teaching conferences and journals continue to focus on many of the same issues that have preoccupied the profession for many years. This inwardness, I suggest, threatens the integrity and competence of the profession, especially in relation to those countries, such as China, where more efficient English language teaching solutions are being sought.

Evolving Role of CALL

Nowhere is fundamental change more apparent than in the area of computer assisted language learning. This is a major breakthrough because it allows learners to interface with the target language in new ways, especially with listening-based activities that should be at the heart of language learning.

Well-designed multimedia lessons can now *coordinate* visual, auditory and contextual input in ways that a book or language lab cannot. It is now possible for true beginners, for example, to receive and interact with optimal language input from the very first lesson with little or no need for text support. By displaying a simple picture or icon, such as a book, a

triangle, or a number, the learner can process the foreign-sounding phrase and immediately know the meaning. No need for text. No need for explanation.

Using CALL, visual and auditory input delivered in a well-ordered sequence can lead the learner to understand the grammar, syntax and vocabulary of the target language with no need for text support. Learners can interact with the presentation, and have their interactions recorded into their study records and even influence the pace and level of the presentation. This is not an insignificant development given the role that text and textbooks have played in traditional approaches to language teaching.

For years people in the profession have said that listening is the key skill, yet most ESL/EFL classes remain dependent on text-based and reading activities as their primary source of language material. Even during listening exercises, many teachers still ask the class questions while those questions are displayed on a screen or in a textbook. A better strategy would be to reveal the text *after* the students have answered each question, or not at all, depending on the situation and student proficiency level.

This dependence on text is unfortunate because research shows that reading and listening skills use different pathways within the brain. In addition, the auditory pathway is considerably faster, involving language processors rooted in the brain's cerebellum, which is far more involved in auditory processing than in any other species. According to one neuroscientist,

> "At the rate words are presented in speech, the speaker or listener must be able rapidly to generate associated words and avoid letting earlier associations interfere. The cognitive search process must be as rapid but as shallow as possible. Any slight tendency to perseverate would entirely derail the process." [Deacon]

Exposing students to auditory input along with text support sets up competing sets of input, making it more difficult to develop the auditory processing speed necessary to decode incoming speech. As another neuroscientist, Richard Restack says, "Competition between sensory channels can also prove disruptive." [Restak]

When students are studying a lesson, they should, therefore, be coached not to rely on text until *after* they have developed their ability to understand and repeat the key sentences. However, many students (and teachers) find the use of text to be a comfortable way to learn

because it gives them time for conscious analysis. Though it may be comfortable, research indicates that it isn't effective. Again, with well-designed CALL lessons, dependence on text can be reduced and the effects on learning can be measured with a fair amount of control.

Listening and speaking skills both involve complex sequences of neural processes and need to be developed in a step-by-step sequence, moving from short, simple phrases to longer, more complex sentences. Students who say they *need* to use text as a support have generally been placed too high and should be encouraged to focus on easier material, at a level where they can process the language input without text.

Wiring the Brain for English

Learning involves changes in the brain. Electrochemical changes and new connections between neurons must occur for learning to take place. Some of these changes happen quickly, and some happen over a period of days or weeks. One very important advantage of multimedia study is the fact that many parts of the brain are activated at once. Having students listen, look at a visual display, process the information, and then record it can activate several areas in the brain and facilitates long-term learning. This is far different than looking at wordlists or sentences and then trying to memorize them. As the famous neuroscientist Donald Hebbs said as early as 1949:
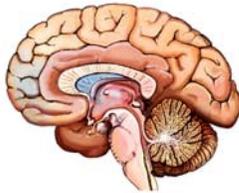
Neurons that fire together, wire together.

CALL multimedia language exercises can provide this kind of learning activity, again and again, with detailed record-keeping to monitor student activity.

Multimedia is, like the name implies, *multi*-modal. A media-rich lesson gives students practice in using visual and other contextual clues to process the incoming language. The rapid *integration* of visual, contextual, conceptual, and auditory input, all within the constraints of working memory and without the distraction of text is the basis for developing listening and speaking skills.

Memory, Learning and Practice

Neuroscientists refer to two different types of memory: declarative (explicit) and procedural (implicit). Declarative memory is used to remember specific events or facts, and procedural memory involves the learning of a sequence of actions or skill acquisition.

Though much of the mental lexicon of a language depends on declarative memory, which deals with facts and events, the mental grammar of a language depends on procedural memory, a "distinct neural system"[Ullman] which deals with motor and cognitive skills. Procedural memory depends on a network of neural structures, including cerebellar structures, that execute relatively automatic subroutines. Neural research suggests that these subroutines are instrumental in rapidly pre-processing sequences of rule-governed sounds. These are especially important in developing listening comprehension, where processing speed is critical. There is simply no time to reflect on or search for rules to decode what one is listening to. Automaticity is required, and this kind of skill acquisition requires practice and *operational* understanding as opposed to conscious knowledge – which can even interfere by diverting one's attention and losing track of what is being said.

Learning techniques that develop procedural memory and unconscious routines are therefore central to effective language learning. This underscores the importance of learning techniques that develop procedural memories and unconscious routines. This is especially true for listening and speaking development. Practice is the key and should predominate in any language learning environment. Repetitive, interactive exercises, though seemingly mechanical, play an essential role in this type of learning and can better prepare language-students to more confidently participate in classroom-based communicative activities such as oral presentations, role-plays and paired activities where well-practiced language routines can be personalized and extended with relative success and confidence.

Language Learning is Skill Development

One of the failings of traditional language learning practices is the attempt to treat language learning as a body of knowledge to be consciously learned. Though conscious learning certainly plays a part in language learning, studying grammar and memorizing

vocabulary is *not* the way to learn language efficiently. This approach fails to address the larger issue of procedural memory and skill acquisition which is at the heart of language learning and which CALL can address.

Learning to communicate in a second language is like learning how to play a musical instrument. Primarily, it involves a set of sensory and cognitive skills interacting with language input and long-term memories that are retrieved and utilized unconsciously in the working memory. As pointed out above, skill development requires effective practice, and this practice must be done on a regular, frequent basis. For language learning, the most effective practice involves multi-modal, coordinated sets of input that progress from listening to speaking, to reading and then to writing: the *4-skills path*. CALL lessons can play an important part in providing this kind of practice, especially the repetitive practice that is at the heart of skills development. Listening to a sentence several times in succession, voice recording and playback, and speech recognition exercises where students practice making questions are all examples of this kind of repetitive practice.

Studies of the brain and long-term memory formation show that repetition strengthens and even builds neural connections and subassemblies that process language. But repetition needn't be defined as parroting the same thing over and over. There are different kinds of repetition. One kind of repetition, "shallow" repetition, is the repeating of an exact phrase or group of phrases. However, since language processing involves the use of a large number of processors to decode the sounds and syntactic elements of language, it is helpful to recognize the fact that though sentences may vary on the surface, their underlying structure may be the same. This allows for a different kind of repetition, "deep" repetition.

Deep repetition involves the repetition of the *conceptual* content rather than the surface details. For example, when focusing on one aspect of the life of a fictitious character, such as their daily schedule, one may repeat the content at a deep level without using any of the same content words by shifting the communicative focus to the lives of each student and *their* daily schedules.   This kind of deep repetition involves many of the same conceptual processors and helps to wire in the neural assemblies necessary to process that set of concepts in the target language.

Varying the learning modality is another way to get useful repetition. By following the "*4-Skills Path*" students can practice communicating a set of concepts (information) in different ways. First, content is introduced in a suitable context through multimedia-based listening and speaking activities which are followed up by classroom activities. After going through a lesson several times on different days -- moving from limited comprehension to full comprehension -- students begin to summarize portions of the lesson, ask and answer questions about the lesson and then make oral presentations or do role plays. These activities are then extended through paper-based reading and writing exercises, either by adding details or by personalizing the content, while still respecting the underlying conceptual content. Integrating the 4 skills in this way provides deep repetition without boring students with repetitive tasks that are needlessly tedious.

This 4-skills learning sequence provides repetition that employs many of the same language processors, brings in new vocabulary and grammar, and brings in additional neural processors (orthographic, etc.) that lead to long-term learning. In other words, the linking and sequencing of listening, speaking, reading and writing activities can provide the type of repetition necessary for skill development – but without the sense of mechanical parroting – though a certain amount of shallow repetition is also necessary as well.

Shallow repetition can and should be provided through interactive exercises that employ such interactive technologies as speech recognition, which students return to again and again, despite the fact that the tasks are blatantly repetitive. Using the music metaphor, shallow repetition is like the practicing of musical scales and should be done frequently, as a part of every practice session.

Sequencing Language Models

Perhaps the most difficult area for teachers to develop is the language syllabus itself. What is it that students should be practicing? What is the learning path? Should the focus be on vocabulary and situational phrases that must be memorized and then pieced together somehow when someone needs to communicate? We all know students who think that the key to language learning is to learn as many vocabulary items as possible. Yet we also know that even if one knew every word in the dictionary, one still couldn't understand a single sentence if the underlying rules of syntax and grammar could not be applied unconsciously. We also know that learning vocabulary items is often an exercise in frustration, because so much is forgotten so quickly.

Again, neuroscience has something to teach us that supports the work of previous writers such as Wilkins (1976), who looked at the underlying conceptual and functional structures of language. In particular, brain research shows clearly that there are highly localized parts of the brain that are conceptual in nature. Poke someone in the brain at just the wrong place, and that person will not be able to determine the relative size or shape of something [Restack].

A key factor in the success of a well-designed ESL/EFL course is the selection of *optimal* input so that language kernels are presented and developed in a learning path supported by student experience and knowledge about the world, including knowledge of content areas such as math and science, not just daily life. Whether we are requesting, suggesting, or explaining, language inevitably involves the exchange of information, much of which can be broken down into concepts such as time, manner, frequency, direction, and degrees of certainty. These concepts are generally marked by a relatively small set of words and grammatical constructions. This set of language elements has great power, because it governs how words and phrases are combined and interpreted – and they occur with great frequency.

Rather than focusing on the uniqueness of each utterance, learners need to focus on the *similarities*. This can only happen if the language presentation is designed to show those similarities – especially important at lower proficiency levels. Order prevails through the application of rules and markers. For example, the verb markers *have+V(n)* and *be+V(ing)*

always occur in the same order: *have been arriving*. There are no exceptions. In English, one cannot say: *is having arrived*, where the markers are reversed. And we cannot use more than one modal, as in *will can go.* Instead, we say: *will be able to go,* which has the same meaning. Regardless of the verb, these rules still apply and tell us how the verb is being used and interpreted. This ordering or concatenation is done unconsciously by neural assemblies that operate like a chain of little subroutines in a software program.

It isn't that language diversity or richness comes from a large vocabulary. Rather, it comes from the variations and combinations of a smaller set of vocabulary and language routines which are processed and applied automatically and then adjusted and interpreted to meet the situation. Fine adjustments and interpretation are based on other sensory input such as visual information, context, vocabulary, and previous knowledge – and employ symbolic thinking of a kind that is unique to humans. But in terms of processing speed, it is a minor adjustment to something done before, like shooting a basketball, or picking up a telephone. Each action is unique, but is appended to a learned sequence that functions like a template. The action sequence is the same, but the final adjustments, though critical, allow for learning and memory efficiency.

To see the power of combination, it's useful to point out that just five numbers: 1, 2, 3, 4, 5 can be arranged in 120 distinct sequences. With ten numbers, the number of distinct sequences grows to 3,628,800. This illustrates how powerful a small number of language items can be, since the combinations are enormous. However, the application of a single rule to the above set of numbers, such as to require that larger numbers must follow smaller numbers, reduces the number of possible combinations to just 1, a clear example of rule-governed simplicity.

In the search for a Universal grammar that underlies all languages, the evidence mounts that this grammar is largely conceptual, and biological in nature, based on how we perceive and experience the world. Organizing the world into time, space, properties, motion, forces and causality are universal and are how we construct the reality about which we communicate.

In this regard, we must also not forget the essential role that visual input and context play in language. The visual display of an icon such as a triangle activates many areas of

the brain. The recognition of a familiar object (or icon) activates knowledge, concepts, and associations about that and similar objects – which are utilized to decode the meaning of a string of sounds. Examples of this 'iconic' approach can be found in *First English* and *English for Success*, multimedia courses which were designed for school-age children and take advantage of what the students already know to help bootstrap the language learning process.

With repetition and appropriately sequenced examples, a multimedia lesson that employs a visual, "iconic approach" can be particularly useful in helping learners comprehend and acquire the underlying grammatical-semantic language structures that are thought to be universal and embodied in the brain.

From this perspective, the grammatical-semantic underpinnings of English are like the trunk and branches of a tree. In contrast, the vocabulary and expressions are like the leaves. There are many leaves on a tree, but without the branches they just drift to the ground.

The trunk and branches are therefore the key elements in a syllabus: the grammar and syntax related to the concepts we need to express. And just like a tree, some branches are offshoots of others and deal with higher levels of detail or abstraction not suitable for the beginner. The key point here is that developing the trunk and branches is far more important than piling on lexical items that have nowhere to go but short-term memory.

Furthermore, from our experience, it seems that the branches, when exercised, become sticky. When specifying size or shape, for example, the brain seems conditioned to look for lexical items that will fit onto that branch. Once there, these items have the tags necessary for quick retrieval. This argues against the traditional use of word lists to be memorized.

Instead, lexical items should be presented so that their grammatical function and conceptual meaning are clearly marked. Once the main branches of the tree are established, elaboration and extension of the language to suit the specific needs of the learner, including the building of a rich vocabulary, becomes increasingly efficient.

Emerging Blended Model

Countries with a growing demand for fluent speakers of English are increasingly impatient and dissatisfied with traditional methods of instruction. This has led to large scale, government-sponsored research initiatives that are redefining the role of language teachers and looking for ways to use technology to increase efficiency and cut costs. With the rapid pace of change, teacher training programs will need to redefine their curricula and bring in new areas of expertise.

As the advantages of multimedia and CALL become clear, language education is moving toward a blended model -- a blend of computer and the classroom. The computer provides the necessary language input and practice activities, and the classroom provides the human element and language extension. This combination allows learners to approach language study much more effectively. With training in how to integrate CALL into their lessons, teachers can finally put into practice many of the theories of language acquisition that have developed over the years and which are now finding support in research from other fields, particularly the neurosciences.

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