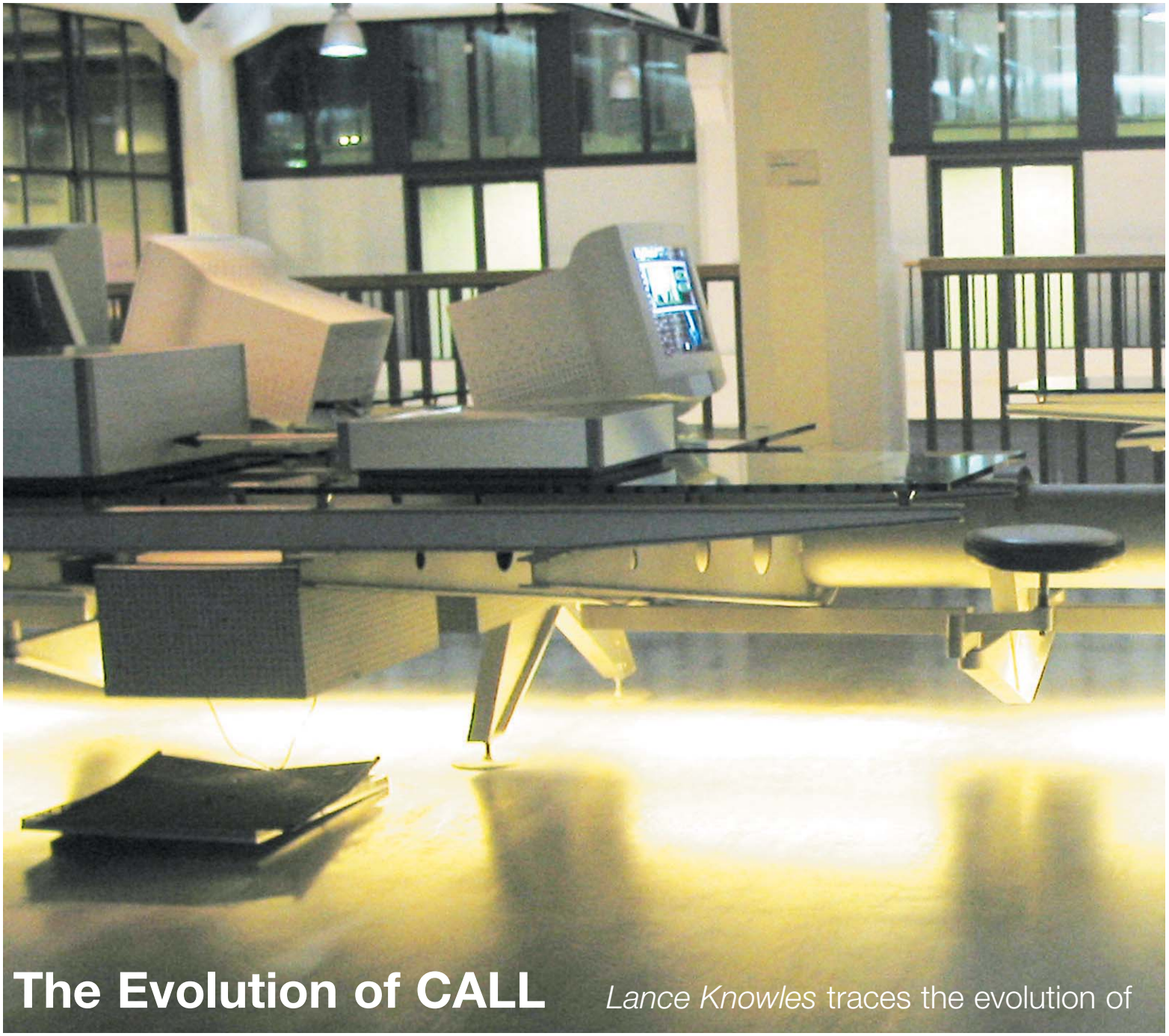

The Evolution of CALL

Lance Knowles traces the evolution of

Computer Assisted Language Learning (CALL) is an emerging force in language education. Despite its awkward beginning and the on-going resistance of many in the language teaching community, it is maturing and showing that it can be a powerful tool in the hands of experienced teachers.

In its early days, CALL was driven by technology and technologists. Proponents of CALL tended to focus on the "Computer Assisted" portion of the acronym rather than the "Language Learning" portion. Technology seemed to offer solutions that could be plugged-in and delivered through a box and game-like interactions. Learning would be fun and relatively effortless, and the role of teachers would diminish.

However, technical limitations and the lack of a reliable delivery and support infrastructure led to an adventurous but unstable environment where much money was wasted. Institutions invested in systems that were either underutilized or were used in ways that had little if any benefit for education other than to keep students occupied and labs appearing to be modern. As for teachers, they were seldom consulted or provided with training, partly because there were few in academia with relevant experience and partly because teachers, with justification, regarded CALL with scepticism and fear. There was an implicit belief that teachers and CALL were competing for the same role — CALL versus classroom-only — rather than in a partnership

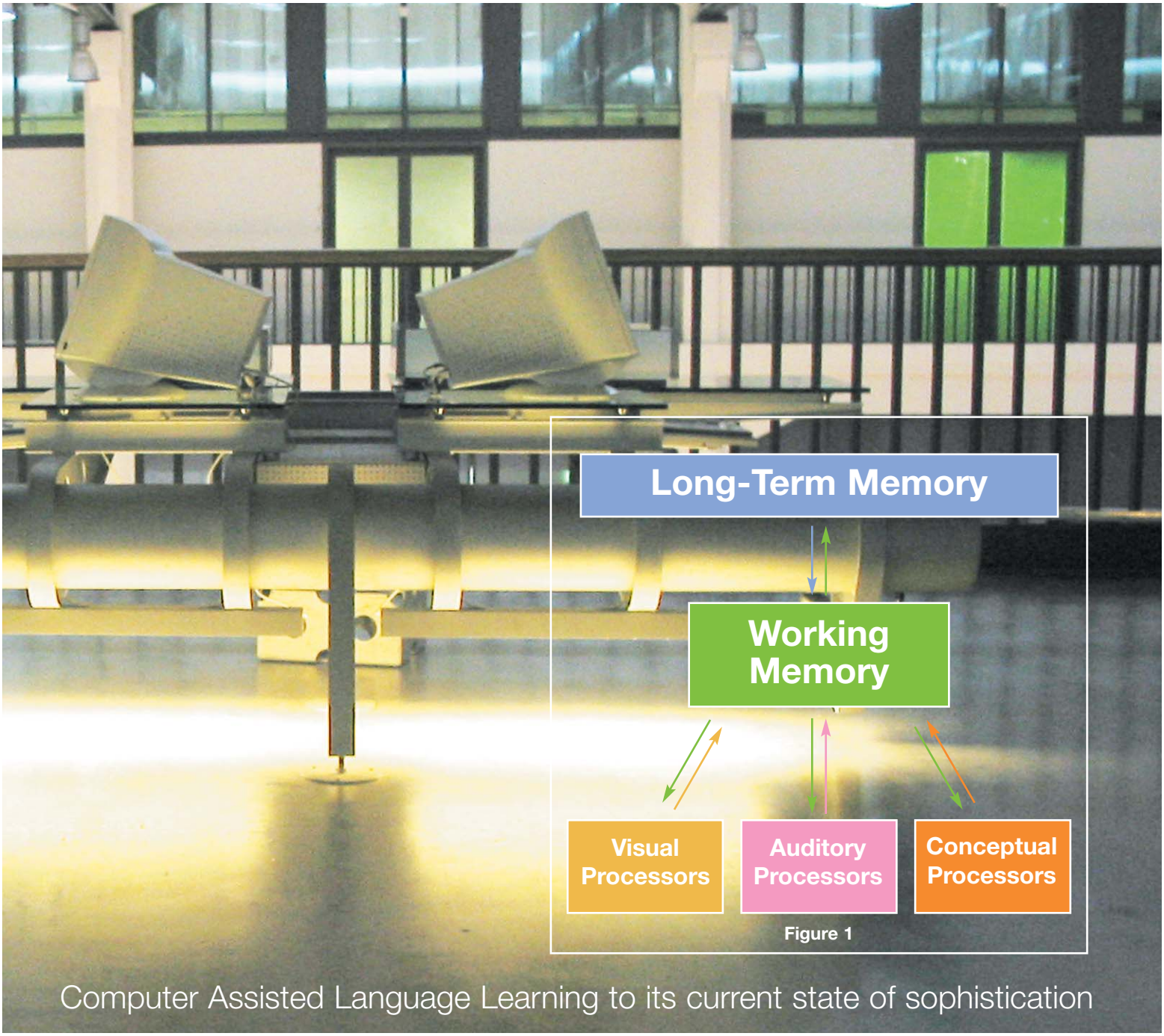

Figure 1

Computer Assisted Language Learning to its current state of sophistication

where each approach "assisted" the other.

What was missed by many was the recognition that the most effective use of technology is not just to do old things in new ways. Rather, the real opportunity was to examine how the new tools of technology had broken through the page and text barrier, allowing the development of a new range of listening-based interactions. This created theoretical opportunities for fundamental changes in language learning, including a rethinking of the relationship between the four skills and the learning synergies between them. What was needed was a learning theory and a model to guide the application of technology.

Multi-Modal Learning

Recent research in the neural sciences has provided many insights into how learning takes place and how language learning may be optimized. In particular, it supports the view that multimedia exercises can be designed to take advantage of how neural processes work together in the learning process. Figure 1, for example, is an oversimplified diagram that shows how various processors in the brain communicate with the working memory, which is instrumental in the learning process. The key point in the figure is that multiple processors, such as the visual, auditory, conceptual, phonological, orthographic, and many others, are involved and can be activated in well-

designed activities. Research shows that these processors work in parallel in the unconscious and interact with the working memory and long-term memory to piece together and interpret language — along with the sensory input that accompanies and supports language.

Neuropsychologist Donald Hebb was one of the first to hypothesize that learning involves the alteration of neural connections. His ideas are often summarized by the phrase: "neurons that fire together wire together," and this is just what CALL allows and promotes. For language learning, a key element is the synchronized activation of the auditory, phonological, and visual systems in the brain, especially important for listening and reading development. These distinct systems work together with grammatical and conceptual processors to decode sensory input into meaningful language. Damage to any one of them, or the connections between them, can severely limit the ability to learn one or all of the language skills.

Laboratory research has revealed that much of this sensory and language processing is extremely fast, especially for listening and speaking skills, and is beyond conscious control. There is simply no time to reflect on or search for rules when one is listening. Automaticity is required, and this kind of skill learning requires practice of a kind that has not been provided in sufficient quantity or quality by textbook-based instruction.

Practice Makes Perfect

The neurolinguist Steven Pinker says that competence comes from practice, and automaticity comes with copious practice. When learning to read, Pinker says, children need practice at connecting letters to sounds, not just immersion in a text-rich environment. He goes on to say:

> "Without an understanding of what the mind was designed to do in the environment in which we evolved, the unnatural activity called formal education is unlikely to succeed." (*How the Mind Works,* 342)

Without question, effective practice is the engine that drives long-term learning, but what are the elements of effective practice? The nature of how neural processors work together and how long-term memories are formed provides valuable insights for both designing lessons and coaching learners how to use effective practice strategies.

The activation of multiple processors at the same time, for example, increases the probability that neurons will wire together to form the neural structures and neural pathways necessary to lead from comprehension, to automaticity, and to long-term learning. This rewiring takes time and is an unconscious process that involves both declarative (i.e., memory of events and facts) and procedural memory (i.e., skill memory, especially involving sequences such as the playing of a piano scale).

Research shows that long-term learning generally requires frequent repetition over an extended period of time. Long-term learning doesn't happen overnight when one crams to pass a vocabulary quiz or consciously memorize a dialog for the next day. Short, frequent practice sessions repeated over a longer period of time appears to be the most efficient way to increase language proficiency.

Of course language learning also depends on the quality and comprehensibility of the language input being practiced. Language models need to be at a suitable level of comprehensibility, and this is where placement and on-going testing are essential. If students are not working with language in an optimum range of comprehensibility, their practice is inefficient and in some cases counterproductive.

Once students are placed, a well-designed multimedia lesson can deliver optimum language through a fluid combination of visual, auditory, and contextual inputs. It can present and coordinate these inputs in ways not previously possible. In addition, it can interact with learners and gather data about their level of comprehension and activity.

With careful sequencing and extension of the language models, students can be guided to where they recognize, comprehend, and can respond appropriately to the modelled language patterns and to variations of those patterns without the need for immediate text or translation support. Then, if they practice saying and recording the language models, they can activate yet another processor, the phonological processor, though this processor would also have been used to some degree in the listening phase.

As listening and speaking fluency develop, the student can then focus on text, both reading and writing - the four skills path. It is interesting to note that in comparison with listening and speaking, reading and writing processors are relatively slow. Listening and speaking fluency can support the learning of reading and writing skills, but reading fluency can slow down and interfere with the development of listening skills, in part because the slower but stronger reading processors will dominate and cause the listening processors to swerve off course, interrupting the automatic decoding mechanisms that must be developed.

Following the four-skills path provides repetition and multi-modal reinforcement that leads to long-term learning. It can also increase motivation, especially if the content is varied and extended at each step. Taken together, and repeated over a suitable length of time, these multiple inputs facilitate long-term learning, not only of vocabulary, but also of the unconscious decoding mechanisms that break down and tag chunks of language for their grammatical and syntactic properties. Without these mechanisms, few sentences of any length can be understood even if the definitions of each word are known.

Blended Learning

Guided by research, learning theories, and by actual classroom experience, CALL is now moving toward a blended model where the multimedia computer provides the necessary optimal input and practice activities, and the classroom provides the human element where the language models come to life and are extended in a social context.

Viewed from this blended model, both classroom and multimedia activities play an essential role. Without the social environment of the classroom, learning is tedious, unmotivating, and too restrictive to meet the needs of learners. Typically, drop-out rates are reported to

be 80 percent or more in e-learning environments where little or no classroom support is available. On the other hand, without the effective practice provided by well-designed, media-rich courseware, language learning is slow, painful and discouraging, a fact borne out by the results of traditional language learning models which suffer from a lack of practice and an overemphasis on memorization and conscious rule learning that is soon forgotten.

In our experience, the blended model can reduce language-learning time significantly, in some cases by 50 percent or more, depending primarily on the following variables:

1. Scheduling of practice sessions for optimum frequency and duration.
2. Quality and design of practice sessions, supported by coaching, feedback, and suitable learning tasks.
3. Sequencing of content and an appropriate mix of skills so that the strategic support elements of language are developed in a well-designed learning path.
4. Classroom sessions that provide extension and personalization of the language models, including the assignment of reading and writing exercises.
5. Suitable technical infrastructure and support.

Once a suitable infrastructure is in place, teacher training is generally the most important factor in the success or failure of a CALL initiative. In the blended model, where practice is emphasized more than ever, students need to be coached and monitored. The quality and design of practice sessions must be supported by coaching and feedback, and this is most effective when provided by a teacher who knows the student and has a good idea about what differentiates effective practice from inefficient practice, the kind that wastes valuable time and de-motivates students.

Well-designed programs can assist the teacher, both in providing coaching and in pointing out practice strategies and materials that are useful at various stages of the learning process. A good records management system can also analyze the study data to identify students who are practicing in inefficient ways, such as not recording or using speech recognition exercises often enough, or those who have other problems that need early intervention. This can be a big time saver for overworked teachers who deal with large numbers of students.

In our own courseware and in our Records Manager, we have developed a new metric, the Completion Percentage, to assess how well students are utilizing each lesson. The Completion Percentage is a measure of the number of micro-learning-steps (MLS) that a student has completed. Taking our cue from the neural sciences, we define a micro-learning-step to be any one of the following: (1) listening to and comprehending a language utterance, (2) recording and monitoring an utterance with comprehension, (3) processing information and completing a task in the target language, and (4) reading or writing a sentence or phrase with comprehension in the target language.

To further assist in the monitoring and coaching of students, we have developed specialized software, the Intelligent Tutor, which combs through the details of each student's learning activities and summarizes the results so that teachers can identify which students need additional coaching. In addition, the Tutor provides specific suggestions about how the class and individual students within the class might improve their practice strategies.

Assessment

Given the problems inherent in implementing large-scale CALL programs, price and accountability are also important factors. A higher-priced product with value can end up being much less expensive, per student, than a lower-priced product with little or no learning value. Quality and effectiveness matter and they can and should be demonstrated. This can be done in a well-designed pilot program or by examining data that supports the claim of a courseware provider.

For CALL courseware developers, the challenge is to continue to create and support lesson designs and activities that can optimize language learning and show quantifiable benefits. Feedback from well-informed teachers, students, test results, and study records from around the world continue to suggest new patterns and provide ample opportunities for further research in this very exciting field. {}

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Lance Knowles *is among the world's foremost experts on the development and use of multimedia ELT courseware. As the founder and President of DynEd International, he has personally led the design of more than ten multimedia courses, including the world's first interactive language learning program on CD-ROM in 1987, and the award-winning course, New Dynamic English.*