Encyclopedia of Distance Learning

Volume I

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The first subproject provides the infrastructure of the Web-based CANDLE system, essential and advanced NLP tools for the other three subprojects, and also tracking mechanisms to monitor online learner progress or history and profile. It has developed three computational scaffolding tools: TOTALrecall, Tango, and Collocation Checker. TOTALrecall is a Chinese-English bilingual concordancer that uses a well-known magazine on facts of Taiwan, Sinorama, as its input corpus (see Figure 2). With learners’ first language, Chinese, a bilingual concordancer’s output allows careful comparison and contrast between the differences of Chinese and English, and facilitates thorough understanding and further learning of the key words or phrases. Our concordancer, TOTALrecall, supports single-word and multiple-word query, exact-string query, query in English and/or Chinese, and conjunctive and disjunctive query. Tango allows the searching of verb-noun (V-N) and adjective-noun combinations (technically it is called collocation). Collocation Checker receives a text input and output with suggestive feedback on potentially problematic word collocations with correct ones (see Figure 3). Subproject 2 focuses on the construction and assessment of an innovative self-access reading environment that is adaptive to learners’ English levels. Subproject 3 works on exploring the potential of using writing or translation activities to help English learning. Subproject 4 uses a bilingual corpus to enhance English-culture learning, an area that has not yet been fully explored. Among its reading-writing cultural courses, a team works on using a speech-recognition engine that can understand Taiwanese variations of English from local learners in a dialogue practice exercise that adopts Sinorama articles as conversation topics, such as a famous local singer, A-Mei. All of them have innovative implications for digital learning, natural language processing (computer engineering), and English teaching and learning. The first subproject also produces required digital and content-related advanced technologies for the other three subprojects, which conduct fundamental research on e-learning strategies and behaviors to prove the usefulness of such advanced English e-learning. In the first year, we have achieved the following development with a computer-assisted management system as part of the CANDLE infrastructure.

The overall structure has been completed as shown in Figure 1 with small-scale formative evaluation on some of its computational scaffolding tools: TOTALrecall and Text Grader. Five small-scale formative assessment studies used TOTALrecall to
INTRODUCTION

Recently, there has been an obvious blooming of the manufacturing of computer hardware and peripherals in Asian countries: to illustrate, Korea, Japan, China, Singapore, and Taiwan. Meanwhile, various information and communications technologies (ICT) and computer games are blossoming among adolescents’ entertainment choices that promote their media literacies. Educators have long acknowledged the potential of using ICT to enhance instruction (hereafter referred to as CBL, computer-based learning), and organized conferences and associations to promote academic activities and disseminate updated information about them. In spite of the similar excitement in the East Asian area, at present, there is almost no authoritative scholarly CBL journal available in East Asia. Descriptions of regional academic-conference activities would help the international community understand the development and academic achievements in East Asian areas. The paper is organized with a detailed description about professional associations and conferences of CBL in East Asia with a focus on language learning, followed by the report of a unique project in Taiwan as an example of East Asian cases.

The evolution of professional organizations in Asia is perhaps like that of other areas: from general to specialized interest. To illustrate, early in 1991 an international conference named “Computers in Education/Computer-Assisted Instruction” (ICCE/ICCAI as an Asian chapter of international ICCE) was held in Taiwan, Republic of China (ROC). The domestic conference ICCE (for some years, its taking place was interleaved with the international conference) was held every year until around 1999, and the formal Association of Computer Assisted Instruction was born here.

Academic disciplines keep evolving and become more and more specialized. Among scholars of different subjects, language professionals started to adopt technologies for educational purposes and stimulated the birth of the area called computer-assisted language learning (CALL). Traced back in history, the first formal organization that was founded to promote the use of computer technologies in the area of (foreign) language instruction is CALICO (Computer Assisted Language Instruction Consortium) in the USA, dated in early 1980 with a regular publication of CALICO Journal. Such an organization was followed by EuroCALL and World CALL. In Asia, the first regional organization may be the Asia-Pacific Association of Multimedia Assisted Language Learning (APAMALL), founded in 2003 (see Crane Publishing, 2003), with a joint conference of multimedia language education in Taiwan (http://www.rocmelia.com.tw). Yet, the development of this organization is still in its infancy, with active involvement of only one organization in Korea and in Taiwan at present. Before APAMALL, formal organizations did not exist except for those in the format of general language conferences in Hong Kong, Japan, Thailand, Singapore, and Taiwan.

As an exemplary case among East Asian countries, Taiwan follows a similar route of specialization. In the area of language studies, the earliest organization related to computer use was the association of ROC Computational Linguistics, founded in 1988, but it had little concern with education until very recently CALL-SIG was developed (which was born in October of 2004). Another line of development that stimulates the birth of CALL in Taiwan is a by-product branching from a general foreign-language teaching association or conference. The largest association in Taiwan is English Teachers’ Association (ETA; 1992), with which some early literature and computer workshops were held with its main annual international conference. Later, this workshop (Litcomp) was renamed Language and Technology Conference, which held its...
fourth year in 2004. Occasionally, some CALL papers appeared in a few ETA conferences. Yet, the real CALL association was not built until 1996, when ROC Multimedia English Language Instruction Association was formally formed (ROCMELIA), and it has hosted an annual conference since. By 2003, it collaborated with the Korean association to rename itself as APAMALL.

For the general trend in other East Asian countries, Korea has its own multimedia association (Korean Association of Multimedia Assisted Language Learning) that published conference proceedings. The delegate who is interested in a joint Asian association is from Language Education and Technology (LET; started from LLA in 1961, renamed several times with a background in the audio language laboratory), but there is another well-known special-interest group of CALL affiliated with the Japanese Association of Language Teachers (JALT-CALL, started in 1993, CALL JALT SIG). CALL-JALT in Japan confessed on their own home page that they were slow in the exploration of CALL. Hong Kong does not have a regular meeting or an association except for two conferences held by a university (ITMELT). Thailand started its own multimedia language conference quite late, but Singapore does not have a special CALL conference at all except for a general language-teaching conference (by the Regional Language Center). The tradition of English-teaching associations has been quite long in Singapore (annual Seminar of the Regional Language Centre since 1966) and in Japan (annual conference of Japanese Association of Language Teachers since 1975). Most of them have published conference proceedings, anthologies, or online selected papers. This evolution may be similar to other East Asian countries as illustrated in Table 1.

**BACKGROUND**

Research and development of computer-based systems or learning environments in Taiwan has evolved from the introduction of computers as gadgets to serious research, and from developing simple drill-and-practice programs (e.g., Liou, Wang, & Yeh, 1992) to ambitious learning environments, such as IWILL (Wible, Kuo, Chien, Liu, & Tsao, 2001).

Almost none of the other scholars regularly surveyed the CALL literature in Taiwan, so the author has to rely on her own works. Liou (1994) reviewed 18 CALL-related studies conducted during 1992 to 1994 and reported on the development of the area in Taiwan. It was found that the acronym, CALL, was not yet recognized in the country, though it was well acknowledged internationally. Evenly distributed

<table>
<thead>
<tr>
<th>East countries</th>
<th>Asian association/regular meeting</th>
<th>Date of recent event</th>
<th>Previous related association(s) (since)</th>
<th>Published (printed) proceedings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>KAMALL/APAMALL</td>
<td>2003</td>
<td>KAMALL</td>
<td>Yes</td>
</tr>
<tr>
<td>Japan</td>
<td>LET</td>
<td>Unclear</td>
<td>LLA (1961), LET, JALT, CALL-SIG</td>
<td>Yes</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>Information Technology &amp; Multimedia English Language Teaching conference</td>
<td>2003 cancelled due to SARS</td>
<td>1999, 2001, biannual</td>
<td>Online papers</td>
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<tr>
<td>Thailand</td>
<td>Multimedia language conference</td>
<td>2003</td>
<td>Unclear</td>
<td>Unclear</td>
</tr>
<tr>
<td>Singapore</td>
<td>RELC</td>
<td>2003</td>
<td>RELC (1966)</td>
<td>Yes (anthology)</td>
</tr>
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</table>
among the topics of (a) languages (mainly English but including German and English-Chinese translation), (b) learning, and (c) learners, the 18 studies illustrated a great amount of enthusiasm in Taiwan. Yet, serious inquiries were called for: "to make the field grow in a sophisticated direction, serious and systematic inquiry into nativized CALL is urgently needed" (p. 275). Specifically addressing video-based multimedia instruction for foreign languages, Liou (1997) reviewed five studies done in Taiwan during 1994 to 1996 and made a sharp distinction between claimed advantages of using multimedia and empirical evidence for effectiveness. The key elements for discussion are (a) courseware features and (b) learner characteristics in the five studies. It was found that multimedia indeed would be motivating for language learners, and could be matched with students of different learning styles or language-learning strategy users to facilitate learner control. Yet, learners must be ready to use the multimedia courseware, and developers may try to develop open-ended language-learning tasks to enhance learning gains. Suggested tips for classroom management and syllabus design were provided.

As Internet applications are widely implemented for language-learning purposes, issues of hypertexts, hypermedia, and computer-mediated communication (CMC) applications (e-mail, bulletin boards, online chat, MOO [Multimedia-domain object oriented], etc.) received their deserved attention in the CALL literature of Taiwan since 1997 until now. The research agendas, besides language, learning, and learners, have been expanded to include the social context of CALL use (Liou, 2002b), as far as the conceptualization of CALL theories is concerned. This dimension would include the infusion of technologies into language curricula and the dissemination of technology use to a wide student population.

Before we address recent CALL development in Taiwan, the international picture may be a mirror for comparison. In the international CALL literature, Levy (2000) addressed the trend of CALL using the 1999 publications of books and CALL journals, and pointed out that 38% of the published papers he reviewed belonged to the engineering side of CALL (i.e., technological aspects of online material development or systems) and were less related to language learning or pedagogy. As far as the publication type is concerned, one third of the literature reviewed was introductory to beginners in the field, and the second third of it addressed CMC issues regarding social impact, cross-cultural factors, and group interaction. The last third of the picture described the development of artifacts such as CD-ROMs, platforms, and so forth. Instead of holding second-language-acquisition theories as the dominant learning paradigm for CALL researchers, he suggested that CMC should be the core. Because there is no recognized or widely circulated professional journal in Taiwan or even East Asia that is devoted to CALL, conference proceedings have become a major source of references that document the development in this country. An analysis of recent conference papers published in ROCMELIA and APAMALL during 2001 to 2003 (Crane Publishing, 2001, 2002, 2003) can illustrate much left to be desired regarding the quality of CALL academic scholarship, although the topics and issues addressed are much more diversified than before. During the three years of 2001 to 2003, there were 118 conference papers published in ROCMELIA annual proceedings. Of these, 28% were written in Chinese, and 72% in English. The classification of all the papers was roughly based on Levy’s work as in Table 2.

The majority of CALL conference papers published in Taiwan belongs to the introductory type (33.4%) in which new computer technology gadgets, useful foreign-language Web sites, or new ideas for using technologies for language education purposes were discussed from personal perspectives or experience. The second major category covers CALL artifacts or development projects (25.2%) conducted by various schools, individual researchers, or government sectors. Project components with technological innovations, but not pedagogical or instructional design principles, are usually the major thrust of such conference papers. Still, a bit less than one fourth of them (23.4%) included both development and evaluation of students’ use and testing, but the research methods were often a simple questionnaire survey of users’ perception. The proven evidence needs more academic rigor to inform the CALL field in Taiwan or the world that a particular implementation in a Taiwan context is empirically effective for a group of learners. The fourth category shows a CALL position or instructional design principle (7.2%); the
Table 2. Types of CALL conference papers during 2001 to 2003 in Taiwan

<table>
<thead>
<tr>
<th>Type</th>
<th>Proportion</th>
</tr>
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<tbody>
<tr>
<td>Introductory</td>
<td>33.4%</td>
</tr>
<tr>
<td>CALL artifact</td>
<td>25.2%</td>
</tr>
<tr>
<td>Development &amp; evaluation</td>
<td>23.4%</td>
</tr>
<tr>
<td>Position</td>
<td>7.2%</td>
</tr>
<tr>
<td>Others (not CALL related)</td>
<td>10.8%</td>
</tr>
</tbody>
</table>

rest of them (10.8%) are related generally to linguistic analyses or issues unrelated to computer applications. Some individual descriptive studies have been conducted on analyzing the corpora of learners’ essays and textbooks. Others compared individual language phenomena using a learner corpus and a particular reference corpus. Few of them used corpora-processing tools or results for online learning (except Wible, et al., 2001).

In spite of all the efforts in East Asian areas regarding the use of computer technologies to teach English as a foreign language or other foreign languages, significant achievements are not evident so far. The lack of enough research manpower, funding support, and even academic rigor are among the three main weaknesses, as compared with achievements in North America or Europe. Dissemination of technology use to schools of all levels is also not smooth due to the lack of systematic governmental support, enough personnel funds, and adequate teacher preparation, in spite of the fact that mostly students are readily computer literate. A digital divide still exists; yet, it is not the shortage of hardware, but rather, computer-literacy education—including the dissemination of infusing computer use to curricula of various subjects—that segregates those who have the adequate knowledge, skills, and experiences for digital learning and those who are deprived of them.

AN INNOVATIVE COMPUTER-BASED LANGUAGE-LEARNING PROJECT IN TAIWAN

In 2001, the Japanese government launched an e-Japan priority policy program in order for Japan to become a nation of the world’s most advanced IT in 2005 (Kuniyoshi, 2003). Similarly, the government in Taiwan, among other East Asian countries, has made continuous efforts in launching several projects to educate its people. In late 2002, the National Science Council (an institution like the National Science Foundation in the USA) in Taiwan launched a five-year cross-agency program (2003-2008), the National Science and Technology Program for E-learning (Liu & Huang, 2003), with $110 million. The program is part of the “Plans for National Development in the New Century” in order to facilitate e-life in a digital Taiwan. The objective of this program is to create a favorable environment to integrate up-, mid-, and down-stream research and development resources to facilitate cooperation among the government, industry, and academia, and finally to materialize the goals in social, industrial, and research dimensions. Thus, it is meant to upgrade Taiwan’s overall competitiveness in the era of knowledge economy, stimulate the development of industries related to e-learning, and bring forth new waves of academic research. Its seven contents of tracks include providing e-learning for every one, narrowing the digital divide, advancing mobile learning devices (e.g., e-schoobags), developing network science parks for e-learning, researching and developing advanced e-learning technology, researching learning and cognition in e-learning, and cultivating policy guidance and manpower. The research and development of advanced e-learning technology sponsors several large-scale, three-year research projects in two batches. The author’s project, CANDLE (Corpora AND NLP for Digital Learning of English), is one of the first batches to advance Taiwan’s digital learning of English by means of corpora processing and computational scaffolding.

Corpora and NLP for Digital Learning of English: CANDLE

The CANDLE project aims to explore innovative pedagogical possibilities and an adaptive CALL
system for English learners (Liou et al., 2003). CALL professionals have been working on harnessing speech- and natural-language-processing (NLP) technologies and Internet resources to revitalize traditional language learning. They have also explored new pedagogy made possible by computers and the Internet. The first goal can be met by an adaptive intelligent CALL system that provides a learning environment that makes systematic and ongoing adjustments based on learners’ individual differences. Adaptiveness to facilitate structural knowledge learning (as theorized in Chan, Hue, Chou, & Tzeng, 2001) can be exemplified by the levels of practice (learner-generated learning activities), feedback, learner profiles recorded, and corresponding tutorial guidance by the system. As for new pedagogy, digitalized corpora are used to facilitate inductive data-driven language learning in ways that have been difficult or impossible in the past. Language data is important for learning because it activates learners’ mental mechanisms and becomes essential input for second- or foreign-language acquisition. With the help of computer corpora in a Web-based environment, inductive learning can be immensely enhanced for learners at anytime and anywhere (Kennedy & Miceli, 2001; Krishnamurthy, 2001; Leech, 1997; Stevens, 1991). Various language-learning activities or tasks that include listening, speaking, reading, writing, and translation, or a combination of two or more skills can be constructed using various corpora or some adaptive computational design to achieve the goal of computational scaffolding (Chan et al.).

Successful digital language learning requires close collaboration between computer engineers and content experts. The field of CALL has been prospering in Taiwan in the past 10 years, but most projects were conducted on an individual or short-term basis with scholars in either computer engineering or CALL background (a good exception is Wible et al., 2001). Few have explored the potential that electronic (bilingual) corpora and advanced natural language processing have provided. Natural language processing is an area of research commonly found in the discipline of computer science or engineering with an aim to use computer programs or algorithms to conduct rule-based or statistical analyses of human natural languages. In a three-year project, CANDLE, over 10 researchers from computer science (specifically NLP areas) and English teaching CALL areas, will work together with the aim to use cutting-edge corpora processing and other NLP tools to advance English learning for students. The project is unique in Taiwan and internationally because it uses the Sinorama Chinese-English bilingual corpus and builds on learners’ first language background knowledge to empower learners with culture-based materials. Both the Chinese and Taiwanese cultures provide a scaffold for learners to use while learning the new language. The project aims at various types of English-learning activities by emphasizing structural knowledge and complex problem-solving learning (Chan et al., 2001): reading, writing, listening, speaking, and translation. Its major features include e-practice that adapts to learners’ levels, automatic assessing and monitoring of learners’ progress, and the profiling of learners’ preferences. By the end of the third year, we will prove such an approach optimally meets the learning goals and needs of local students.

Description of the CANDLE Project and Its Initial Achievements

Although communicative language teaching is still popular in North America and reaches its peak in Asian countries, some theorists suggest that learners should be guided first toward understanding and responding meaningfully to language, and subsequently noticing and describing the grammatical structures whose meaning they have understood without necessarily recognizing them as structures. Learners are not supposed to immediately learn grammar rules by merely focusing their attention on them; instead, learners gradually assimilate grammar rules over time by continuing to notice them in the language as they come across them. A crucial feature of the task-based language-learning approach is that it is the learners, not the teachers, who formulate grammatical rules using the evidence of the examples in the language. The main idea of the approach is that the process of working out the rules helps the learner process the rules more deeply and therefore encourages effective learning. Along the line and with the advance of Internet technologies, computer language corpora have played a much more important role than before. The use of corpora tools helps to realize a balance between communica-
tive language use and awareness of grammar structures. Corpus linguists study real texts, using explicit algorithms to extract linguistic knowledge from corpora. An important function of corpora in the language classroom is to provide the learners with concentrated exposure to particular patterns of repetition. With the use of corpus tools, language learners can avoid unhelpful reliance on oversimplified rules prepackaged by the teacher; instead, they develop proficiency through focused, purposeful exposure to, and use of, language in specific contexts.

Computational scaffolding and adaptive systems can go hand in hand. First used by Wood, Bruner, and Ross (1976), scaffolding was applied in a parent-child talk where the capable adult supports the less capable child to learn. Scaffolding provides the kind of support "that is responsive to the particular demands made on children learning through the medium of a second language—that is critical for success" (Gibbons, 2002, p. 11). Likewise, an adaptive CALL system needs to match the target language-learning units to the learner’s current level and make adjustments as the learner moves forward in the system. During the process, computational scaffolding can be provided in many forms such as different levels of explanation or different feedback for various error types per session in an intelligent tutoring system, or different exercise sets designed for learners in a practice system, based on various learners’ online and ongoing performance recorded on the tracker’s learning history. There may be other innovative designs that make full use of NLP and that do what human teachers cannot do easily—specifically for language learning; they warrant further exploration.

Based on the two trends, a Web-based English-learning project merges the expertise from the NLP scientists and engineers and CALL scholars on English learning in Taiwan. It is named CANDLE. The innovations of CANDLE lie in the use of corpora and the provision of computational scaffolding (Chan et al., 2001) for English learning. Adaptive learning has been one of the ultimate goals for the teaching of many subjects, including English, because it aims to meet individual learners’ needs in various domains. Computational scaffolding in an adaptive system can be systematic and precise in assisting English learners to achieve higher level proficiency when they engage in CALL tasks.

These goals are achieved through the collaboration of four subprojects (see Figure 1).

1. Natural language processing and assessment tools
2. The reading component
3. The writing component
4. The culture component

*Figure 1. Overall CANDLE structure and its four sub-projects with its respective modules*
The first subproject provides the infrastructure of the Web-based CANDLE system, essential and advanced NLP tools for the other three subprojects, and also tracking mechanisms to monitor online learner progress or history and profile. It has developed three computational scaffolding tools: TOTALrecall, Tango, and Collocation Checker. TOTALrecall is a Chinese-English bilingual concordancer that uses a well-known magazine on facts of Taiwan, Sinorama, as its input corpus (see Figure 2). With learners' first language, Chinese, a bilingual concordancer's output allows careful comparison and contrast between the differences of Chinese and English, and facilitates thorough understanding and further learning of the key words or phrases. Our concordancer, TOTALrecall, supports single-word and multiple-word query, exact-string query, query in English and/or Chinese, and conjunctive and disjunctive query. Tango allows the searching of verb-noun (V-N) and adjective-noun combinations (technically it is called collocation). Collocation Checker receives a text input and output with suggestive feedback on potentially problematic word collocations with correct ones (see Figure 3). Subproject 2 focuses on the construction and assessment of an innovative self-access reading environment that is adaptive to learners' English levels.

Subproject 3 works on exploring the potential of using writing or translation activities to help English learning. Subproject 4 uses a bilingual corpus to enhance English-culture learning, an area that has not yet been fully explored. Among its reading-writing-cultural courses, a team works on using a speech-recognition engine that can understand Taiwanese variations of English from local learners in a dialogue practice exercise that adopts Sinorama articles as conversation topics, such as a famous local singer, A-Mei. All of them have innovative implications for digital learning, natural language processing (computer engineering), and English teaching and learning. The first subproject also produces required digital and content-related advanced technologies for the other three subprojects, which conduct fundamental research on e-learning strategies and behaviors to prove the usefulness of such advanced English e-learning. In the first year, we have achieved the following development with a computer-assisted management system as part of the CANDLE infrastructure.

The overall structure has been completed as shown in Figure 1 with small-scale formative evaluation on some of its computational scaffolding tools: TOTALrecall and Text Grader. Five small-scale formative assessment studies used TOTALrecall to
test whether and in what aspect the tool could help English learning through questionnaire surveys, learner-produced writing, or online answers to drill items, as well as reading behaviors. Two English culture courses and one English writing course have infused TOTALRecall as a self-study online tool into their English course syllabi. The other two studies developed online materials that incorporated TOTALRecall, which are detailed.

To more rigorously control the English-text difficulty level for a particular group of learners and conduct an experimental comparison about word exposure effects, we have designed an online extensive reading module for college students' winter-break homework on a self-access basis. The texts were prepared beforehand using corpora-processing tools based on foreign-language vocabulary and reading research findings. Scholars claim that texts reaching 95% familiar word coverage for specific groups of English learners may be a requirement for incidental learning; too many unfamiliar words would impede on reading comprehension, let alone on acquiring new words. Yet, the bottleneck of preparing such appropriate texts is the challenge for both researchers and classroom teachers without computing tools. With the help of word-list research and quantitative corpus analyses using word-frequency computer programs, choosing appropriate materials that meet learners' levels is accomplished in our Text Grader (partly based on Ghadirian, 2003). We filtered texts with four word lists and selected 16 articles: the General Service Word List, a local senior high students' word list, the University Word List, and an exposed word list out of the original 5,008 articles in the Sinorama corpus (Liou & Huang, 2004). Easier articles were sequenced first to be read with another control group of times of target-word exposure. Pretest and posttest measures were used to investigate what the adequate amount of exposure for words to be acquired incidentally is for receptive or productive use (e.g., understanding or making a sentence). With the carefully selected reading materials, we then designed an online reading curriculum for 38 college freshmen students to read at home for a period of 12 weeks, enhanced with an online glossary and highlighting of words being exposed in previous texts. A background questionnaire and an evaluation questionnaire were used as additional research instruments. It was found that the "familiar words" and new words were verified as such on this particular group of learners based on the pretest scores. As the online program was used as homework, incentives of course grades and teachers' coercion were needed for them to do self-directed reading and learning. Initial results indicated the online program was helpful for weak learners, and good learners may choose to read print materials for extensive reading as the online program did not allow them to do marginal marking. Final results showed that learners improved their vocabulary scores after using the reading program, but the precise amount of word exposure for comprehension or production was not verified. Generally, such a design of an online extensive-reading syllabus was proved pedagogically feasible, verified by learner satisfaction.
Collocation (appropriate word combination) has been acknowledged as a crucial aspect in vocabulary learning, but the area has long been neglected in foreign-language teaching. Previous work in the literature reveals that English learners were seriously deficient in collocations, which are a hallmark of near-native fluency in learners' writing; good learner-writers used collocation more appropriately and frequently than poor learner-writers did. Among different types of collocation, the verb-noun type was found to be particularly difficult for Taiwanese learners to master. Previous studies indicated that learners' first language would heavily influence their production of correct collocations. The writing component of the CANDLE project incorporated the Collocation Checker and developed the online Collocation Practice module. The practice module has six units, based on the analyses of common miscollocations by local learners (Liou & Chan, 2004). Both deductive and inductive teaching methods, together with the use of TOTAL recall to encourage inductive learning, were incorporated into the design based on the nature of particular V-N types. Practice-item types include multiple choice, fill in the blank, and translation questions. Then, 32 college freshman students were recruited to participate in the empirical evaluation part with pretest, posttest, and delayed posttest measures of 36 purposefully sampled items of blank filling in a sentence context. Additionally, a background questionnaire and an evaluation questionnaire were used to elicit participants' data and perception about the effectiveness of the practice module. Results indicated that learners made significant collocation improvement immediately after the online practice, but regressed after two and a half months. Different collocation types, induction and deduction, and learners with different prior collocation knowledge were not equally receptive to the practice effects. Both the online instructional units and the concordancer were acceptable to most participants.

**FUTURE DIRECTIONS**

The major features of the CANDLE project are its extensive use of various corpora and natural-language-processing tools in order to build computational scaffolding for intermediate learners in Taiwan. Various levels of online help are provided for learners while they engage in reading, writing, or cultural learning activities. With bilingual corpora, the project features the support of learners' mother-tongue culture to advance their English learning. While a team works on NLP tool development, other members work on a self-access reading component, a writing component, and a culture component. Learning effectiveness of each of the components will be verified through real classroom use with empirical methods and curriculum infusion modules in the future. The project is unique in Taiwan and internationally because it uses the Sinorama bilingual corpus and builds on learners' first language background knowledge to empower learners with culture-based materials. With the three-year project, we will achieve the following goals via the CANDLE Web site.

1. widely circulate resources of the CANDLE learning center for as many students to use as we can reach given three years
2. provide empirical evidence or usability testing data to prove CANDLE’s usefulness or effectiveness
3. explore the possibilities of curriculum infusion in various universities or colleges for different learners

The advances, innovations, and practicality of CANDLE achievements for English learning, given three years with over 10 researchers, can be expected. Previous literature shows that CALL research is weak in evaluation. In CANDLE, evaluation methods such as psychometric means in a comparison design, discourse analysis, or portfolio will be conducted in the third year to advance the understanding of learners' behavior when they work online. We envision that learners will be capable of the complex problem solving needed to network with foreign-language users in other countries. This is a means to achieving the goal of learner autonomy and lifelong learning. Learners will move from computational scaffolding to full participation in the English-speaking discourse community. They will expand their horizons from Taiwan to the world by surfing the Net and also making the waves.
Specific future directions that extend the CANDLE project are to collect different genres of learner corpora and to explore its pedagogical applications. Second, to ensure successful curricular infusion of CALL into foreign-language learning, teacher education with preservice preparation, and in-service professional development is crucial.

CONCLUSION

In this entry, the dynamics of CALL in East Asia are presented. Furthermore, the development of using technologies for language-learning purposes in an East Asian case, Taiwan, is reported with its current breakthrough digital learning project, CANDLE.

CALL enthusiasm and academic activities abound in high educational institutions, but it is still not popularly applied in high schools and primary schools in Taiwan and other East Asian countries. If technology infusion is to take root in schools, CALL promotion to real classrooms of every level is a must. In that case, practicality, social impact, and cultural factors may play more important roles than psychometric concerns when educators plan to disseminate the use of technology on a large language-learning population. In the illustration where two CALL cases are examined using new evaluation perspectives (Liou, 2002c), it is found practically feasible to implement concordancing (Lee & Liou, 2003) and MOO (http://formosa.fl.nthu.edu.tw:7000; Liou, 2002a) in the English curricula of senior high schools in Taiwan, where sociocultural factors are positive for technology use. Yet the alternative goal or construct, the use of English in a real context instead of having a static knowledge of English and passing exams, takes time for the entire society, students’ parents, and educational administrators to accept. Last, language teachers as guides to move the curriculum need professional development about technology use so that they can have it as part of their regular instructional materials and skills, and can use technology naturally to achieve educational goals. Our students have outperformed teachers as far as technological literacy is concerned; teachers are the key to transform traditional language education by incorporating the frequent use of pedagogically sound technological tools into their daily teaching.

ACKNOWLEDGEMENTS

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Computer-Assisted Language Learning in East Asia

RESOURCES

2. CALICO in the USA: http://www.calico.org
5. CALL JALT SIG in Japan: http://jaltcall.org
7. iWill, an online writing system in Taiwan: http://www.iwillnow.org
10. National Science and Technology Program for e-Learning in Taiwan: http://elnlp.ncu.edu.tw
11. The CANDLE project in Taiwan: http://candle.cs.nthu.edu.tw

KEY TERMS

CALL: A well-recognized acronym among language educators that is a subbranch of CBL with a focus on first-language or often second- or foreign-language teaching and learning.

Collocation: The occurrence of two or more words within a short space of each other in a text (Sinclair, 1991); they usually form a unit semantically.

Concordancer: A text-manipulation tool originally used by lexicographers but nowadays popularly promoted among foreign-language teachers and learners. Such a program displays character strings before and after a key word or phrase based on the computer text corpus the program is fed.

Corpus: A collection of naturally occurring language text, chosen to characterize the state or variety of a language (Sinclair, 1991).

Language-Learning Strategy: Learners’ conscious techniques or skills that help their language learning while they are working on language tasks (O’Malley & Chamot, 1990).

Extensive Reading: Reading for pleasure or information gathering instead of reading to increase language knowledge, which is called intensive reading where learners look up all unknown words and take reading as a study skill.

MOO: Multimedia-domain object oriented. A kind of online mechanism that was originally used for virtual-reality-type games but was adopted for educational purposes later. MOO has been widely used to teach various foreign languages including English. ForMOOsa (http://formooa.fl.nthu.edu.tw) was the first one constructed in Taiwan (Liou, 2002a).

Natural Language Processing: Using various computing technologies to process natural languages used by human beings (as opposed to machine or artificial languages) in order to understand or produce the languages. For instance, parsing as a typical type of processing is to analyze an English sentence in order to group words into a subject (doer of an action) and verb phrase (the action).

Computational Scaffolding: The kind of online support “that is responsive to the particular demands made on children learning through the medium of a second language—that is critical for success” (Gibbons, 2002, p. 11).