Theoretical and Research Bases for the Technology Standards

This chapter is revised and expanded from the TESOL Technology Standards Framework Document *(2008). It offers an overview of research that informs the technology standards, as well as suggestions for using the standards in CALL research.*

Research in Computer-Assisted Language Learning (CALL)

The TESOL Technology Standards are informed by and best understood with background knowledge of the theory and research that have emerged in the field of CALL. There is currently no clearly articulated single theory specific to technology use in language teaching that could be used to inform these standards. Numerous scholars believe that the theoretical foundation for this field comes from a multitude of sources. Following Ellis (1999), Chapelle (2003, p. 56) takes the key concept of interaction and discusses three theoretical perspectives: the interaction hypothesis, sociocultural theory, and depth of processing theory. For each perspective, she demonstrates how a computer can help a language learner in some relevant way—by providing enhanced input, help for using language, and opportunities for increased attention to language, respectively. Those looking for a more unified view may find it in Egbert, Hanson-Smith, and Chao (2007). These authors take the position that "the hypothetical theory of CALL sounds not much different from an integrated theory of language acquisition; in fact, it is the same" (p. 1).

Levy and Stockwell (2006) reach a similar conclusion, noting that "with rare exceptions, CALL designers and language teachers are predominantly in the role of consumers as far as theory is concerned. For those in this group who see value in theory (and it must be said not all do), they review, select, and apply theories of language learning produced by others" (p. 139). Kern (2006) links this relationship of consumerism to a general issue in second language acquisition (SLA) theory: Citing Kramsch (2000), he observes, "it is important to bear in mind that SLA is itself

informed by a rich variety of theoretical frameworks and has consistently resisted a single overarching theory" (p. 187).

The situation with research in the CALL field is similar. Egbert and Hanson-Smith (2007) attempt to unify the field by organizing their edited volume with results from a broad research base. In that volume, the introduction (Egbert, Hanson-Smith, & Chao, 2007) delves into eight optimal conditions for language learning. However, Levy and Stockwell (2006) identify six research strands with accompanying representative studies reflecting a "mix of approaches, methods, research tools, and procedures" (p. 157). An edited volume devoted specifically to CALL research (Egbert & Petrie, 2005) includes 12 chapters representing a wide variety of research perspectives and providing further evidence of fragmentation that is similar in many respects to divergences in SLA and general learning theory.

In addition to the work above, a strand of recent relevant literature centers specifically on language teacher education in the technology domain. Special issues of *Language Learning and Technology* (2002) and *Innovation in Language Learning and Teaching* (2009), along with edited volumes by Hubbard and Levy (2006b) and Kassen, Lavine, Murphy-Judy, and Peters (2007), focus on this area. Among the themes found in multiple contributions to this literature are the value of project-based learning, the importance of reflective learning, linkages to communities of practice, and development of teacher candidate portfolios (for more details, see Chapter 6 in this volume). Each of these edited volumes also includes a chapter on standards: Murphy-Judy and Youngs (2006) and Oxford with Jung (2007), the latter taking a highly critical view of current implementations.

Despite the large number of theories and research approaches, it is possible to identify three general themes that both support the need for the TESOL Technology Standards and identify necessary content for the standards themselves.

1. Research shows that there are important benefits to be gained from the use of technology in language learning and teaching.

Numerous studies looking at the effect of CALL on language learning support the integration of CALL in language teaching. A recent research synthesis by Grgurović and Chapelle (2007), looking at 200 experimental and quasi-experimental studies between 1970 and 2006, revealed that (a) computer instruction is slightly better than "traditional" instruction even under the most rigorous methodological conditions and that (b) "improvement is detected for CALL groups more often than not" (slide 24). Consequently, it is imperative that teachers be able to make decisions about the role of CALL in their pedagogy. However, only teachers with sufficient knowledge about CALL can make that decision wisely.

There is also evidence indicating important benefits of technology in language learning and teaching. These are found mainly in

1. improved motivation and development of positive attitudes toward learning and the target language (e.g., Meunier, 1997; Pennington, 1996; Warschauer, 1996),

2. improved learning outcomes (e.g., Brandl, 2002), and

3. improved retention rates (e.g., Ioannou-Georgiou & Michaelides, 2001).

Additional applications of CALL that have been studied include access to linguistic and cultural materials, opportunities for communication, provision of feedback, and learner motivation. Zhao's (2003) synthesis outlines efforts in these areas and calls for further research on comprehensive curriculum development, effective use of technology, classroom uses of technology, and empirical studies on how technology is used in schools.

2. Technology should be incorporated into teaching pedagogy so that students will not only effectively acquire a second language but will also develop electronic literacy skills.

Teaching our students language in its traditional media is no longer enough. Traditional literacies, such as reading and writing, are now only a subset of the skills a learner is required to develop in order to function efficiently. Increasingly, in everyday and professional life, people need the skills of electronic literacy, such as accessing, evaluating, and utilizing information (Warschauer, Shetzer, & Meloni, 2000).

Chapelle and Jamieson (2008) argue for an expanded view of English language teaching pedagogy, which now ought to include not only the learner, the English language, and the teacher, but also technology as an integral part. Chapelle and Jamieson articulate three assumptions of language learning on page 3 in the introduction to their book:

1. Guidance in learning a language is necessary.

2. English manifests itself in many varieties.

3. Teachers provide guidance and structure.

They explain that CALL may be able to provide opportunities to complement already-used teaching strategies. Specifically, CALL can foster skills development (reading, writing, listening, speaking), but it can also further language proficiency development by providing learners with the opportunity to practice these skills, which is, as recent research suggests, how language is learned (Lightbown & Spada, 2006).

Integration figures prominently in the current discussion of CALL, in writings by Levy and Stockwell (2006), Bax (2003), and others. Scholars debate certain aspects of the notion of integration and how to achieve it, but with the ubiquity of today's technology, it is difficult to justify not using CALL in language learning. It is, therefore, imperative that English language teachers integrate information and communication technologies (ICT) in the classroom so that students become

proficient in communication not only within the traditional media but also within the framework of modern communication technologies (Lee, 2002, inter alia).

The use of technology in English language teaching and learning can also encourage the development of strategies necessary for modern survival: communication, collaboration, and information gathering and retrieval. Preparing students for the information society should be one of the fundamental aims of today's education (European Commission, 2001; Organisation for Economic Co-operation and Development, 2000; U.S. Department of Education, 2000). Ultimately, technologically skilled individuals benefit not only themselves but also their country of residence. Australia, for example, has already recognized the great importance to the country's economy of training individuals to work in an online environment (Australian National Office for the Information Economy, 1998, as cited in Davison, 2005).

Hubbard and Levy (2006a) emphasize the importance of CALL beyond the classroom, such as in the "research and development of a wide range of products including online courses, programs, tutors, and tools" (p. 9) and in the repurposing of off-the-shelf software. The common theme here is that technology is and should be used for language learning purposes.

3. Research shows that technology in learning is not being used to its full potential and that inadequate teacher training and learner training are some of the main reasons for this.

The importance of basing teacher training on standards and the detriment of not meeting the standards are discussed by Oxford with Jung (2007). They note that technology standards already exist for primary and secondary (preK–12) teachers and students in the United States, but indicate that the standards are routinely not being met in settings with English language learners, for reasons that include problems with schools of education, teacher educators, and institutional infrastructures. Oxford and Jung conclude with research-based advice aimed at solving this problem.

There are, therefore, significant benefits to language learning that can be achieved by using new technologies and by enabling students to obtain basic survival skills for the modern society and workplace. How many of these potential benefits are actually brought to the students, however, is questionable. Cuban (2001) gives evidence that computers are underused in today's classrooms. In general education and in language learning alike, Cuban writes, computers are mostly used for teacher preparation, and mainly for word processing. Even where computers are not used as expensive typewriters, and where teachers use them in instruction, traditional teaching techniques prevail. As a result, the technology's potential for developing critical-thinking skills and learner autonomy remains largely unrealized.

Cuban asserts that this is not due to limited access to technology. Rather, he suggests that it might be due to the way teachers use the technology, thus implicating teachers' inadequate training in the area of pedagogical uses of technology. However, teacher

training must also include learner training. In other words, teachers who use CALL must be trained to teach learners how to use CALL programs, an issue discussed by Hubbard and Levy (2006a). Foundations for learner training in using technology for language acquisition, especially as it relates to developing learner autonomy, can be found in Barrette (2001), Healey (2007), and Hubbard (2004).

This need for increased training and proficiency in the use of technology is echoed by Kessler (2006), who points out that "teachers need to become more proficient in their understanding of CALL methodology, practices, history, and possibility" (p. 35). Along the same lines, Chapelle and Hegelheimer (2004) argue that "the resources offered by today's technologies for language learners and teachers provide valuable opportunity to rethink and perhaps reinvent what constitutes the knowledge base for L2 teachers" (p. 314).

Thus, with the weight of responsibility falling on the teachers and their work, the existence of the TESOL Technology Standards will play a positive role. The standards can help teachers and teacher preparation programs move forward and guide them in increasing the quality use of new technologies during instruction in ways that realize technology's potential. Further, developing an understanding of the growing body of CALL research will not only inform the interpretation and use of these standards but also contribute to future revisions to the standards.

Research has investigated specific domains within CALL, including telecollaboration, computer-mediated communication (CMC), tutorial CALL, online learning, and resource CALL. Across these domains we can observe pedagogical implications from the research in two ways: as they relate to the learning of language skills and as they relate to the role of the CALL environment. It is important for teachers to be aware of these studies because collectively they emphasize that integrating technology effectively into language classrooms requires more than simply laying knowledge of the technology on top of their basic classroom procedures. The studies cited here provide a foundation for meeting the targets of Teacher Goal 2, Standard 4: *Language teachers use relevant research findings to inform the planning of language learning activities and tasks that involve technology*. Table 2.1 provides a brief overview of some implications from research into individual language skills.

Research has also been conducted regarding the nature of various CALL task types and environments. Many of these studies provide guidance for ways in which teachers can use general and language learning software within specific contexts and language tasks. Some of the trends from this research are presented in Table 2.2.

Research in CALL has followed methodological trends in the broader area of second language acquisition (SLA). Survey results have been used often, typically to identify perceptions or attitudes toward some element of CALL. Comparative studies have been conducted in order to compare the integration of CALL into a curriculum with traditional teaching methods. Observational studies based upon language transcription have been conducted in order to analyze linguistic functions that may provide insight into SLA within CALL contexts. Some have recognized the limitations

Table 2.1. Trends in Research Into Individual Language Skills

Source	Implications From Research Into *Writing*
Bloch (2008)	The public nature of online writing provides motivation and accountability.
Selfe & Hawisher (2004)	Multiple literacies must be considered.
Ware & Warschauer (2006)	Automated Writing Evaluation (AWE) tools promote formulaic writing.
Chambers (2005)	Writing can be corpus-driven.
Liang (2010)	Collaborative technologies can support peer response groups.
Payne & Whitney (2002)	Extensive CMC writing can also enhance speaking fluency.
Source	**Implications From Research Into *Reading***
Chun (2006)	Availability of electronic texts allows for greater appropriateness of level and topic.
Cobb (2007)	Level and frequency of vocabulary can be adjusted for optimal learner retention.
Cobb (2007), Huang & Liou (2007)	Corpora can be used to enhance reading skills and vocabulary contextualization.
Source	**Implications From Research Into *Speaking***
Celce-Murcia, Brinton, & Goodwin (1996); Hincks & Edlund (2009)	Visual feedback can benefit speaking volume, rate, fluency, and pitch.
Tanner & Landon (2009)	Guided pronunciation readings can reduce errors related to pausing, stress, intonation, and overall comprehensibility.
Borras & Lafayette (1994)	Using subtitles can benefit oral proficiencies.
Source	**Implications From Research Into *Listening***
Grgurović & Hegelheimer (2007)	Subtitles and transcripts can support developing listening skills.
Verdugo & Belmonte (2007)	Digital stories can improve listening abilities.
Zhao (1997)	Learners benefit from control over speech rate.
Source	**Implications From Research Into *Form***
Hinkel & Fotos (2002)	Grammar can be learned through focus on form, acts of interaction, or samples of discourse.
Chapelle & Jamieson (2008)	Grammar material must be selected carefully, considering difficulty, requirements for production, and degree of instructional explicitness.
Pérez-Llantada (2009)	Grammar instruction can be corpus-based.
Kessler (2009)	Attention to form is increased during peer review.
Sauro (2009)	Varied forms of corrective feedback are valuable.

Table 2.2. Trends in Research Into CALL Environments

Source	Implications for *Synchronous Communication*
Smith (2003)	Text-based synchronous communication resembles speech.
Fiori (2005)	Synchronous communication with training helps develop grammatical competence.
Source	**Implications for *Asynchronous Communication***
Warschauer & Healey (1998)	Asynchronous communication allows for greater reflection.
Abrams (2006)	Asynchronous tasks benefit from varying degrees of teacher intervention.
Source	**Implications for *Hybrid/Online Language Learning***
Belz (2003), Warschauer & Kern (2000), Ware (2005)	Telecollaborative projects benefit from cultural orientation.
O'Dowd (2006)	Telecollaborative projects offer opportunities to increase intercultural communicative competence.
O'Dowd & Ware (2009)	Telecollaborative projects require careful group and task construction.
Compton (2009)	Online projects require unique teacher preparation.
González (2008)	CALL provides opportunities for exposure to authentic language.
Levy & Stockwell (2006)	CALL provides opportunities for extensive practice.
Source	**Implications for *Language Labs***
Kolaitis, Mahoney, Pomann, & Hubbard (2006); Winke & Goertler (2008)	Learner training is important for any environment.

of relying solely upon the textual output of a task and enhanced these practices with keystroke capturing (Fischer, 2007), student use of help menus (Grgurović & Hegelheimer, 2007), and screen capturing (Smith, 2003). Most recently, research has expanded into cognitive and perceptual observation. These emerging studies rely on psycholinguistic-based practices and data such as MRI data and heat maps produced by eye-tracking technology (Smith, 2010).

Conclusion

As we can see, CALL research and theory are informed by a diversity of academic investigation. We understand that technology has been identified as a beneficial component in language teaching and learning when properly incorporated into teaching pedagogy. This understanding recognizes that teachers require preparation to identify and integrate technology in their teaching pedagogy. We have learned that technology can be harnessed to strengthen language learning strategies,

cultural knowledge, and individual language skills. This chapter highlights specific language-skill-related findings within the field of CALL. We have also learned how the integration of technology varies across different domains, task types, and environments. This variety of integration must be recognized for teachers to effectively address the technology standards. Finally, we understand the changes in methodological approaches within CALL. These can influence teachers' perspective on the research and contribute to their own reflective practices, including action research. This overview of theoretical and research bases that have informed CALL is intended to serve as support for integration of the TESOL Technology Standards. This review is not intended to be a comprehensive evaluation of CALL research. Readers who are interested in further exploration of CALL research would benefit from consulting the following resources.

Resources

Hubbard, P. (2005). *Survey of unanswered questions site*. Retrieved from http://www.stanford.edu/~efs /callsurvey/

Ohlrogge, A. & Lee, H. (2008) *Research on CALL and distance learning: A briefly annotated bibliography*. Retrieved from http://www.calico.org/DistanceEdBiblio.pdf

Siskin, C. B. (2005). *Selected bibliography for CALL*. Retrieved from http://www.edvista.com/claire/callbib .html