Twenty-Five Years of Theory in the CALICO Journal

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ABSTRACT

In honor of CALICO's 25th anniversary, this study looks at the presence and collocations of the term *theory* across issues in 25 volumes of the *CALICO Journal*. Utilizing the electronic versions of articles now available to all subscribers and the built-in search engine on the CALICO website, 244 articles in which the word *theory* appeared were initially identified. Of those, 78 included examples where *theory* only appeared in the reference list or the author's biographical statement, leaving 166 articles to form the corpus to review for in-text examples. This paper reports on the number and types of theories identified in the corpus, noting the wide range overall but exceedingly small number of references to what could be considered native CALL theories, as well as commenting on the value and limitations of this approach for reviewing scholarly work.

KEYWORDS

Theory, Search Engine, Keyword, Collocation, *CALICO Journal*

INTRODUCTION

Theory, research, and practice are terms that permeate professional publications in any applied academic field. Of these, the most abstract, and the one perhaps seen as holding the most legitimacy, is theory. Most research is expected to have a theoretical connection, and practice ideally reflects a theoretical orientation (Richards and Rodgers, 1982) as well as a research basis. Levy and Stockwell (2006) introduce their chapter on theory in the context of CALL by noting that researchers use theories to expand existing knowledge in circumscribed domains (as well as to build on and refine the theories themselves) and that designers and teachers use theories to help them decide what to focus on and what to ignore in their practice. Chapelle (2003) offers a concrete example, discussing three theoretical perspectives on the concept of *interaction* and giving each a CALL twist: the interaction hypothesis, sociocultural theory, and depth of processing theory. She shows how a computer can aid a language learner in a relevant way for each, providing enhanced input following the interaction hypothesis, help for using language in line with sociocultural theory, and opportunities for increased attention to language linked to depth of processing theory.

We find the word *theory* showing up in a number of books and articles connected to the field throughout its history, from ACTFL's volume *Modern Media in Foreign Language Education: Theory and Implementation* (Smith, 1987) to CALICO's own *Calling on CALL: From Theory and Research to New Directions in Foreign Language Teaching* (Ducate & Arnold, 2006). So what is CALL theory? It is clear from the start that, as is the case with psychology, linguistics, education, and second language acquisition, there is no single "theory of CALL." A recent edited volume (Egbert & Petrie, 2005) identifies a number of distinct CALL research perspectives in the field, and many of their differences can be traced to their respective underlying theories. More to the point, Levy and Stockwell (2006) observe that "with rare excep-

tions, 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).

With theory having such a presumed prominence in academics, to the extent that CALL is perceived as a discipline in its own right, it is useful to understand better how the concept is manifested within publications in the field. In support of that objective, this paper explores instances of *theory* across the entire range of *CALICO Journal* issues from June 1983 to September 2007. It was motivated in part by the announcement of this silver anniversary issue of the *Journal*, but it was made possible by the recent shift of the *Journal* to its online environment. Not only is the full archive now available to subscribers in electronic form, but, most important, the CALICO website includes an application for finding instances of search terms across all of the *Journal* articles, described in the methodology section below. By exploring the collocations and local contexts in which *theory* occurs in a rich but targeted corpus like this, the study provides a representative overview of theory in CALL across what was arguably its first quarter century of existence as an identifiable professional field.

It would of course be inappropriate to hold up the *CALICO Journal* as representing all of CALL. There are several other major journals devoted more or less exclusively to CALL topics (*Language Learning & Technology*, *ReCALL*, and the *CALL Journal* in particular), and several other journals, such as *System*, that publish significant CALL-related works, not to mention the growing number of CALL-centered monographs and edited volumes. While not comprehensive, the *CALICO Journal* nevertheless provides a rich source of relevant data, as it, along with CALICO symposia and special interest groups, has been a leading agent in the development of CALL over the past 25 years, bringing together researchers, developers, and practitioners in a common arena, promoting the critical scrutiny and professional dialogue that have helped to introduce, refine, and disseminate ideas of importance to the advancement of the field.

The following research questions are addressed in this study:

1. How commonly is the word *theory* used in articles across the *CALICO Journal*?
2. What specific theories are mentioned?
3. What are the dominant theories?
4. What are the identifiable examples of "native CALL" theories?
5. What disciplines do the articles draw their theoretical references from?

It should be noted that this is in part a study not only of questions above, but also of this general approach which may grow in appeal as more resources (including books) move to an online electronic format and search applications become more robust. So a question underlying this whole enterprise is the following: Can we discover anything interesting or useful with this kind of approach?

METHODOLOGY

The current CALICO website has two features that made this study feasible. The first is a search engine that allows the user to put in a keyword and find references to it across all the *CALICO Journal* articles published since the journal began in 1983. The second is the availability of the full PDF versions of the articles to subscribed individual or institutional members.

The search feature displays 15 articles per page and provides the title and direct link to the article along with instances of the keyword in context (*theory* in this case) with typically 10 or more words on either side of it. One limitation of using the system for our purposes is

that it provides only the first five instances of the keyword in any given article. When five were indeed present in the data, this necessitated going to the full version of the article and using the browser's Find command to locate any additional instances. In a few cases, it was also necessary to go to the original article if the theory reference was not clear from the extract, for example, if a pro-phrase like "the theory" did not include the antecedent in the context. Figure 1 shows an example of the results from the CALICO website search engine.

Figure 1
Example Search Results for "theory" on the CALICO Website
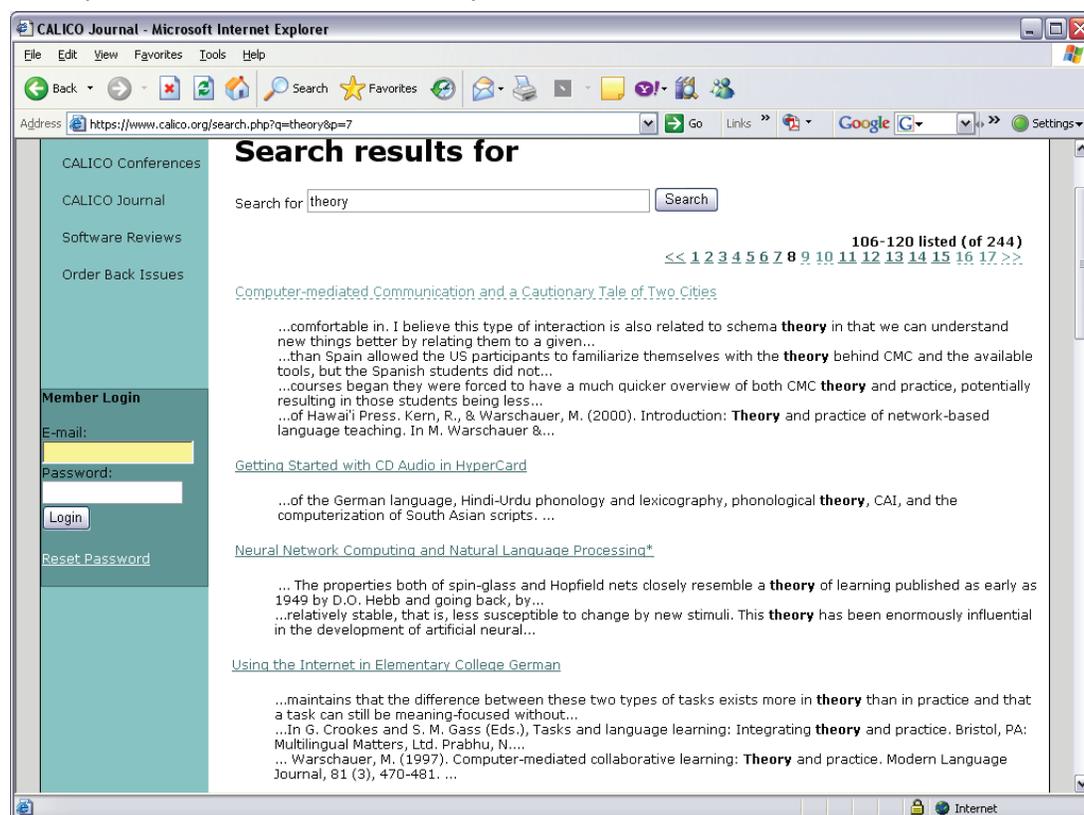
Several times during the month of November 2007, I logged in to the CALICO website and searched for the word *theory*. The first time the results were copied and pasted into a Word document for offline reference; however, each time I returned the page showed exactly the same number of articles tagged—it appears that the search engine provides consistent re-sults (as one would expect) at least until the site is updated when the next issue is published. Since I was looking for references to specific theories (e.g., schema theory) or general theory classes (e.g., linguistic theory) labeled as such, I did not look for alternatives such as *theories* or *theoretical*. Similarly, because of the presumed potency of *theory* in this context I did not search for related concepts like *approach*, *model*, or *framework*. Note, however, that obvi-ously synonymous phrases (e.g., "theory of learning" and "learning theory") are considered identical for consistency in the counts, and only the simplest form is provided in the tables below.

Once the instances of *theory* were collected, the collocations or other referential infor-mation identifying which theory was being referred to were placed in a table and counts for each were provided (see the appendix at the end of this article). The counts represented the number of articles in which a phrase containing *theory* appeared at least once, rather than the

total number of tokens of *theory* in the corpus. So if a theory was mentioned five times in a single article but not in any other ones, the count was 1, and if a theory was mentioned just once in one article and five times in another, the count was 2.

RESULTS

As noted above, when the search engine returned five hits for a given article and the final one was not obviously in the reference list or author's bio section, it was necessary to go to the full version of the article and use the browser's Find command to locate any additional instances of *theory*. Although not part of the original intention of the procedure, this also provided a check on whether the search engine was accurately locating all the instances within an article. In the 34 cases where it was necessary to reference the original, this secondary search confirmed that the five instances tagged were indeed the first five in the article.

The review of 244 articles in the *CALICO Journal* in which *theory* appears shows the following trends. In 78 of the articles, *theory* is found only in reference lists, because it appears in the title of works that the journal contributors refer to or in the author's biographical statement at the end. These were set aside leaving a corpus of 166 articles where *theory* occurred in the main text.

There were 63 articles in which the word appeared in what could be considered a generic sense, as in the following phrases: "theory and practice," "theory and research," "technology and theory," "pedagogy and theory," and other similar ones. This count also includes instances of "theory" appearing more or less independently without any additional reference and the frozen phrase "in theory." Note that these often co-occurred with nongeneric uses described below. There were also six examples, each appearing in a single article, where the phrase with *theory* did not appear to have any relationship with either language or learning: "calculus theory," "communism as theory," "evolutionary theory," "relativity theory," "supply side theory," and "theory of the leisure class." These were excluded from the tables below but appear under a separate heading in the appendix.

For the remaining examples in which there was an identifiable reference for *theory*, the corpus was divided into three groups. The first group includes theory references that appeared in a single article in the corpus; the second, references that appeared in two articles; and the third, references that appeared in three or more articles.

Table 1 shows the long list of *theory* references appearing in a single article in the corpus, a total of 77 unique descriptors. Examples range from the very broad (language theory) to the very specific (sonority of the ideal syllable theory).

Table 1
Theory References Appearing in Only One Article in the Corpus

"no significant difference" theory	Gradual approximations theory	Quantitative theory
3-generation theory	Hebbian theory	Reading theory
4-generation theory	Indo-European trifunctionalism theory	Reinforcement theory
Abstraction theory	Information theory	Role stabilization theory
Attention theory	Input processing instruction theory	Sens-it Cell theory
Automaton theory	Input theory	Situated cognition theory

Brazil's discourse automation theory	Interactive theory of reading	Social learning theory
CALL theory	Intercultural communication theory	Socio-educational theory
Capacity theory	Invested effort theory	Sonority of the ideal syllable theory
Case theory	Krashen's theory	Speech act theory
Cognitive reading theory	Language theory	Spreading activation theory
Cognitive theory of development	Learner control theory	Stimulus-response theory
Cognitive theory of word learning	Legitimate peripheral participation theory	Structuralist theory
Community of practice theory	Lexical processing strategy theory	Technology assisted language learning theory
Complexity theory	Mind-centered learning theory	Text comprehension theory
Component display theory	Moore's theory of interaction	Theory-driven CALL
Computation theory	Moore's theory of transactional distance	Theta theory
Constructivist theory	Multiple intelligence theory	Total physical response theory
Curriculum planning theory	Myers-Briggs Type Indicator theory	Transformational grammar theory
Curriculum theory	Networking theory	Transparency theory
Discourse processing theory	Neural network theory	True narrative representation theory
Ego permeability theory	Output theory	Usage-based grammar theory
First language composition theory	Phonetic coding theory	Vygotsky's theory
Focus on form theory	Piaget's ontogenic development theory	Writing theory
Foreign language composition theory	Predicate theory	X-bar theory
Foreign language theory	Psycholinguistic theory of language learning	

Table 2 presents the list of *theory* references appearing in exactly two articles in the corpus. This a much shorter list composed of 19 unique items.

Table 2
Theory References Appearing in Exactly Two Articles in the Corpus

Cognitive theory of multimedia	Grammatical/grammar theory	Latent trait theory
Assessment theory	Information processing theory	Principles & parameters theory
Bruner's theory	Input processing theory	Psycholinguistic theory
CMC theory	Instructional theory	Syntactic theory
Communication theory	Interactionist theory	Testing theory
Conceptual dependency theory	Language teaching/instruction theory	Working memory theory
Dual coding theory		

Table 3 contains the remaining 17 instances of unique *theory* references, along with an indication of the number of articles in which the phrase appears. The majority of these appear in just three articles but others appear in larger numbers.

Table 3
Theory References Appearing in Three or More Articles in the Corpus

Activity theory - 3	Lexical functional grammar theory - 3	Item response theory - 6
Cognitive theory of learning - 3	Sociocultural theory - 3	Schema theory - 6
Educational theory - 3	Sociolinguistic theory - 3	Linguistic theory - 7
Government & binding theory - 3	Generative theory of multimedia - 4	Learning theory - 20
Instructed SLA theory - 3	Pedagogical theory - 4	SLA/language acquisition theory - 25
Jung's theory - 3	Phonological theory - 4	

DISCUSSION

Not counting generic uses, there were a number of examples in this body of literature where the use of *theory* referred to a field or general class of theories. Typical examples of this category include "linguistic theory," "SLA theory," "pedagogical theory," and "learning theory." However, the majority of references were to a specific theory, such as "the generative theory of multimedia," "lexical functional grammar theory," "dual coding theory," and "input processing instruction theory." There were also subcategories of the broad ones which were still not as specific as the preceding examples. For instance, "syntactic theory" is a subcategory of "linguistic theory" but has specific theories under it as well, such as "lexical functional grammar theory" and "government and binding theory".

Let us now return to the research questions presented in the introductory section.

1. How commonly is the word *theory* used in articles across the *CALICO Journal*?

    The counts provide a clear answer to this question. The word *theory* is widely used by authors, appearing in the text of 166 articles.

2. What specific theories are mentioned?

    An exact listing is difficult without going to all of the original articles (a task beyond the scope of this paper) because the excerpts in the search results do not always make clear whether some theory references are broad or specific. For example "input theory" could refer to Krashen's (1982) original Input Hypothesis or to the more general view taken by other SLA researchers that comprehensible input plays an important role in language acquisition but is not the dominant driving force. However, an examination of Tables 1-3 shows that the majority of the 113 distinct theory references appear to be to specific theories. What is perhaps surprising, then, is that so many different theories seem to have captured the interest of *CALICO Journal* authors.

3. What are the dominant theories?

    A somewhat unexpected finding from the data was that, at a level labeled by the authors as "theory," there were none that could be legitimately labeled "dominant." The top counts were for broad uses linguistic theory (7), learning theory (20), and second language

learning or SLA theory (25). Only three specific theories stood out as having more than three articles that referenced them: generative theory of multimedia (4), schema theory (6), and item response theory (6), the last of which interestingly is related to assessment rather than language or learning.

4. What are the identifiable examples of "native CALL" theories?

    The data reflected only a few examples of references to anything that could be labeled as native to CALL, that is, a theory which has technology in language learning at its foundation and that then may draw on one or more theories from more established domains for support. There was only a single reference to "CALL theory" and another to "theory-driven CALL," and those were in passing. There were also two articles referencing "CMC theory." Only one article (Oller, 1996) appeared to propose a clearly CALL-focused theory.

5. What disciplines do the articles draw their theoretical references from?

    Others have written about the wide variety of inputs to CALL from other fields. Chapelle (1997), for instance, noted references to 14 fields and perspectives used in "the profession's quest for principled means of designing and evaluating CALL" as examples of some of the range of sources found in CALL literature in the 1990s (p. 19). Levy (1997) listed 24 "disciplines, fields, and theories with relevance to CALL" (pp. 49-50). While the list in the appendix is considerably longer and more detailed, it is possible to draw a general sense of the theoretical grounding of CALL from the contributions to the *CALICO Journal's* 25 volumes. Based on the data presented here, "CALL theory" in the abstract (akin to "linguistic theory" or "SLA theory") can be considered primarily an amalgam of

    1. technology-centered extensions of theories related to learning from psychology and education,

    2. technology-centered extensions of theories of second language acquisition,

    3. technology-centered extensions of theories of linguistics used primarily in CALL projects involving natural language processing, and

    4. language learning-centered extensions of theories of human-computer interaction or technology in education.

    Note that the preceding four categories are meant to include both direct portings of the theories to CALL environments and CALL-specific adaptations of them.

Although some answers to the research questions were found in the data, there are several limitations to this study that should be mentioned, some of which are traceable to the approach itself. First of all, a simple count like this, even when the immediate context is considered, does not capture the difference between a casual reference to a theory and the use of it as a significant foundation for the study in which it appears. To determine with greater certainty which theories are being used as foundations for CALL research, development, and practice in *CALICO Journal* articles, the articles themselves would need to be explored in greater depth than was done here. Second, by focusing exclusively on the word *theory*, concepts related to what are arguably theoretical positions but that failed to use that word were not discovered. An example of this can be found in the small number of references (two) to "interactionist theory." One explanation might be found in the fact that many proponents of this view refer to it as a "perspective" or "approach" rather than a theory. Searching the corpus instead for *interactionist* yielded 16 articles with the following additional collocates following that word: approaches, literature, mold, theories, perspective, model, framework, research,

approach, hypothesis, studies, researchers, notions, view, based research, SLA stance, and sense. Finally, the study did not distinguish between more and less recent views, collapsing the 25 years of the *CALICO Journal* into a single corpus. An interesting extension might be to look at differences between patterns in the earliest and most recent 5 years of the corpus.

Considering the final question hovering in the background—Can we discover anything interesting or useful with this kind of approach?—the answer is a qualified "yes." The limitations above reflect the fact that a mere word and collocation count of the type presented here is relatively superficial and does not offer nearly the depth that studies such as Levy's (2002) review of *design* across the CALL literature of 1999 provides. However, prior to the availability of electronic tools like those used here, this type of review could only have been accomplished by a laborious manual count of instances of the target word in context.

CONCLUSION

In line with other studies (Levy, 1997; Levy & Stockwell, 2006), the data here demonstrate the wide range of theoretical underpinnings for CALL. In fact, the count of unique referents exceeds those of previous studies by a considerable margin (though to be fair previous work did not specifically look for the word *theory*). With 166 articles showing *theory* somewhere in the text, it is clear that *CALICO Journal* authors do not as a group shy away from using the term in justifying their work, and it would not be surprising to find similar patterns in other CALL publications. However, what is largely missing, at least at the level of analysis here, are references to what I have called "native CALL" theories. Why is this so?

One possible reason is that CALL has been and continues to be viewed as a subordinate domain of inquiry, in particular as a subfield within instructed SLA (Chapelle 1997, 2003), informed but also in some sense bound by the theoretical models and perspectives of its parent. For some, the end game of this position is that CALL eventually disappears as a result of the normalization of technology in the language classroom (Bax, 2003). Another possibility is that CALL has simply not yet fully emerged as an independent discipline, one which, though appropriately influenced by and closely connected to instructed SLA, has the capacity to look beyond theories, perspectives, and models developed primarily to account for and advance teacher-led (though ideally learner-centered) language classes. We can return to Levy and Stockwell's (2006) observation from the opening that "with rare exceptions, CALL designers and language teachers are predominantly in the role of consumers as far as theory is concerned" (p. 139) and add CALL researchers, and perhaps even theorists, to that group. In accepting this role for theory in CALL, we stand to gain visibility and greater acceptance among the mainstream adherents of established viewpoints and are able to draw on their research bases both for CALL purposes and to extend their theoretical perspectives into the technology domain. Perhaps we lose something as well, however. We lose the opportunity to develop theory for a more independent field, one that could have at its *core* the goal of understanding the ways in which a computer in all of its many manifestations, from desktop to laptop to cell phone to interactive whiteboard, isolated or networked, can manipulate and mediate variables of interest in improving language learning, teaching, and use. Based on the publications in the *CALICO Journal's* first 25 years, we seem so far to have avoided treading the latter path.

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APPENDIX

List of unique "theory" references and counts of the number of articles for each. Note that phrases such as "theory of learning" are rendered here as "learning theory" for consistency.

Theory reference	Count
"no significant difference" theory	1
3-generation theory	1
4-generation theory	1
Abstraction theory	1
Activity theory	3
Assessment theory	2
Attention theory	1
Automaton theory	1
Brazil's discourse automation theory	1
Bruner's theory	2
CALL theory	1
Capacity theory	1
Case theory	1

CMC theory	2
Cognitive reading theory	1
Cognitive theory of development	1
Cognitive theory of learning	3
Cognitive theory of multimedia	2
Cognitive theory of word learning	1
Communication theory	2
Community of practice theory	1
Complexity theory	1
Component display theory	1
Computation theory	1
Conceptual dependency theory	2
Constructivist theory	1
Curriculum planning theory	1
Curriculum theory	1
Discourse processing theory	1
Dual coding theory	2
Educational theory	3
Ego permeability theory	1
First language composition theory	1
Focus on form theory	1
Foreign language composition theory	1
Foreign language theory	1
Generative theory of multimedia	4
Generic uses of *theory*	63
Government & binding theory	3
Gradual approximations theory	1
Grammatical/grammar theory	2
Hebbian theory	1
Indo-European trifunctionalism theory	1
Information processing theory	2
Information theory	1
Input processing instruction theory	1
Input processing theory	2
Input theory	1
Instructed SLA theory	3
Instructional theory	2
Interactionist theory	2
Interactive theory of reading	1
Intercultural communication theory	1

Invested effort theory	1
Item response theory	6
Jung's theory	3
Krashen's theory	1
Language teaching/instruction theory	2
Language theory	1
Latent trait theory	2
Learner control theory	1
Learning theory	20
Legitimate peripheral participation theory	1
Lexical functional grammar theory	3
Lexical processing strategy theory	1
Linguistic theory	7
Mind-centered learning theory	1
Moore's theory of interaction	1
Moore's theory of transactional distance	1
Multiple intelligence theory	1
Myers-Briggs Type Indicator theory	1
Networking theory	1
Neural network theory	1
Output theory	1
Pedagogical theory	4
Phonetic coding theory	1
Phonological theory	4
Piaget's ontogenic development theory	1
Predicate theory	1
Principles & parameters theory	2
Psycholinguistic theory	2
Psycholinguistic theory of language learning	1
Quantitative theory	1
Reading theory	1
Reinforcement theory	1
Role stabilization theory	1
Schema theory	6
Sens-it Cell theory	1
Situated cognition theory	1
SLA/language acquisition theory	25
Social learning theory	1
Sociocultural theory	3
Socio-educational theory	1

Sociolinguistic theory	3
Sonority of the ideal syllable theory	1
Speech act theory	1
Spreading activation theory	1
Stimulus-response theory	1
Structuralist theory	1
Syntactic theory	2
Technology assisted language learning theory	1
Testing theory	2
Text comprehension theory	1
Theory-driven CALL	1
Theta theory	1
Total physical response theory	1
Transformational grammar theory	1
Transparency theory	1
True narrative representation theory	1
Usage-based grammar theory	1
Vygotsky's theory	1
Working memory theory	2
Writing theory	1
X-bar theory	1

Nonlanguage/learning references

Calculus theory	1
Communism as theory	1
Evolutionary theory	1
Relativity theory	1
Supply side theory	1
Theory of the leisure class	1

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Philip Hubbard is Senior Lecturer in Linguistics and Director of English for Foreign Students at Stanford University's Language Center. A CALL professional for the past 25 years, he is the author of over 20 disk-based and CD-ROM programs for ESL and has published articles across a range of CALL areas, including methodology, research, software development, software evaluation, teacher education, and learner training. He is the co-editor with Mike Levy of *Teacher Education in CALL*. He currently serves on the CALICO Executive Board and the *CALICO Journal* Editorial Board. He is also on the editorial board of *Language Learning & Technology* and is Associate Editor of the *CALL Journal*. His current interests center on using technology in developing listening proficiency and expanding CALL as an independent field of inquiry and practice.

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