Despite its brief history, computer-assisted language learning (CALL) has been informed by a wide variety of theories, and that variety appears to be growing. In the first section of this chapter, we describe the concept of theory in this field and discuss its role in illuminating what happens when humans interact with materials and one another through the mediation of digital devices, programs, networks and tools in the pursuit of language learning objectives. In the second section we provide detail concerning the enormous diversity of theories that have been used by CALL researchers and practitioners and offer a typology of theory use in CALL, ranging from theory borrowing to theory construction. The third section looks more closely at the role of theory in CALL research. We begin with a brief overview of three of the more prevalent theoretical foundations for CALL research: the interaction account, sociocultural theory and constructivism. We then include a short example of contrasting theoretical analyses, sociocultural and interactionist, on the same topic: synchronous computer-mediated communication. The fourth section considers the role of theory in CALL practice, emphasising the pragmatic use of theories by teachers and developers to inform their choices of design and implementation and the increasing role of collections of theories we label theory ensembles. The final section focuses on current trends in theory, highlighting examples of how theory is being utilised in the growing segment of digital gaming for language learning, and concludes by speculating on the direction of theory in CALL for the future.

The place of theory in technology and language learning

In the late 1970s and early 1980s, language teachers with access to the new desktop 'microcomputers' and an urge to tinker began creating their own simple programs to support their students' learning. In time, a critical mass of these language teachers and their institutional support staff would converge at language teaching conferences and create an embryonic field, widely, though not universally, known as computer-assisted language learning (CALL). Over the past three decades, the overall field and individual parts of it have expanded dramatically, leading to a number of other appropriately descriptive terms and acronyms. However, given the number of professional organisations, conferences, books and journals that have incorporated the term CALL,
Theory in computer-assisted language learning

for ease of exposition and continuity with previous work we use it throughout this chapter to refer to the field as a whole.

This chapter provides an introduction to CALL theory. Research, practice and theory can be said to constitute the three foundational pillars of any applied field. Indeed, the field of applied linguistics – or more specifically, second language acquisition (SLA), to which CALL is often said to belong (see e.g. Chapelle 1997) – is supported by the same three pillars. Given that close connection to SLA, it is useful to begin with a consideration of how theory is viewed there. Mitchell, Myles and Marsden (2013) characterise theory for SLA in broad though somewhat traditional scientific terms: ‘a theory is a more or less abstract set of claims about the units that are significant within the phenomenon under study, the relationships that exist between them, and the processes that bring about change’ (p. 2). They further note that ‘theories may be embryonic and restricted in scope, or more elaborate, explicit, and comprehensive’ (pp. 2–3). Finally, following a more or less standard rationalist position, they note that theories aim at explanations rather than just descriptions. However, other SLA scholars, such as Long (1990), acknowledge that not all theories incorporate explanations. For the purposes here, we also take into account more pragmatic conceptions of theory (Coyne 1997), the idea that theory and practice are intertwined in the pursuit of solutions that work. This is a position that is particularly in line with the needs of developers and teachers (Levy and Stockwell 2006), whose utilisation of theories we discuss later in the chapter.

Consequently, we use the term CALL theory to represent collectively the set of perspectives, theoretical models, frameworks and specific theories that:

1 offer generalisations to account for phenomena related to the use of digital technology in the pursuit of language learning objectives;
2 ground and sustain relevant research agendas;
3 inform effective CALL design and teaching practice (Hubbard 2009, 2012).

We acknowledge that this characterisation is not universal and that some may wish a broader or narrower scope. However, we believe that this is a useful starting point for the discussion that follows.

For readers new to the field, it may be surprising to discover that there is no established CALL theory or even set of CALL theories that have been developed internally by scholars in the field to uniquely characterise it. Instead, CALL is largely a consumer of theories from other sources, not only at the level of teaching and development (Levy and Stockwell 2006: 39) but arguably also in its research tradition. In the next section, we look at the range and most common disciplines from which theoretical sources are drawn and offer a typology of their use within the field based on how those sources are utilised.

Theoretical sources in technology and language learning

Those who venture into a discussion of theory in the field of technology in language teaching and learning must tread carefully. Background and biases may lead one to expect more coherence and consistency than demonstrably exist. Although digital technology has only been a significant component of language teaching and learning for a few decades, the theoretical landscape captured by its researchers and practitioners is already wide-ranging. In a review of theory in a single specialist journal (the CALICO Journal) over the period 1983 to 2007, Hubbard (2008) extracted references to 113 distinct theories across 166 articles. With the exception of a small number of general labels (SLA theory, learning theory, linguistic theory, etc.), these
were specific references (activity theory, item-response theory, speech-act theory, schema theory, cognitive theory of multimedia, etc.). Surprisingly, there were no clearly ‘dominant’ theories showing up with any consistency: in fact, none of the specific theories mentioned appeared in more than six articles, and 77 of the 113 appeared in just one.

That review identified four primary sources for the theories: (1) language learning–centred extensions of human-computer interaction or technology in education theories, (2) technology–centred extensions of second language acquisition theories, (3) learning theories from psychology and education and (4) linguistic theories. Interestingly, across twenty-five years of articles, it identified just one solid reference to a theory developed specifically for this field: Oller’s (1996) technologically assisted language learning theory, along with one reference to generic ‘CALL theory’ and two to ‘CMC [computer-mediated communication] theory’. Despite all the work in CALL-specific research and methodology, there appears little at the CALL-specific theory level.

The type and sheer quantity of sources reflect the complexity and diversity of the field up to that time. However, given the range of other published sources and the years that have passed since 2008, the number of theoretical sources incorporated in CALL works no doubt greatly exceeds the 113 from that study. As we show in the final section, the range of theoretical sources continues to grow as concepts from domains such as gaming (see Reinhardt and Thorne, Chapter 30 this volume) begin to take hold in language education.

In order to understand the role of theory in CALL, it is not enough to focus just on their number and the diversity of their sources. It is also important to see how these theories are co-opted, combined and potentially evolve as a result of being applied in an environment they were not originally conceived for. To address this issue, Hubbard (2009) introduced a framework for categorising the type of theoretical presence in CALL works. We next summarise that framework and expand it with two additional categories. The categories presented stand in contrast to atheoretical CALL (Hubbard 2009), a label that can be applied to studies that have no explicit theoretical connection.

Theory borrowing
The simplest and most direct employment of theory in a CALL study is theory borrowing. This process consists of taking a theory from another domain such as linguistics, psychology, education, human-computer interaction and especially second language acquisition and plugging it in to the CALL environment without any changes. In fact, a significant subset of research in computer-mediated communication (CMC) fits into this category. The objective of many of such studies is to show that the CMC environment can be analysed as having features, such as the negotiation of meaning construct from the interactionist perspective, that are claimed to facilitate language acquisition. See for example the discussion of Fernández-Garcia and Martínez-Arbelaitz (2002) in the following section. In theory borrowing, a theory is used as a frame to test the environment, but the theoretical construct (i.e. negotiation of meaning) remains untouched.

Theory instantiation
Related to theory borrowing is theory instantiation, a category absent from the original Hubbard (2009) framework. We introduce it here to accommodate studies that take general purpose or broad learning theories such as activity theory, ecological theory or the theory of affordances (see Blin, Chapter 3 this volume) and situate them in a language learning environment where the technology and language can both be explicitly recognised as elements for analysis. An
example is Basharina (2007), who uses activity theory to analyse and interpret student-reported contradictions in a three-country telecollaboration. Instantiating the activity theory framework in the given telecollaborative environment made it possible to incorporate the online bulletin board as a mediational tool and identify three breakdowns that students connected to its features: message overload, slowness of bulletin board versus chat, and name and gender confusion due to an absence of visual cues. Our sense of instantiation differs, for example, from borrowing directly from interactionist SLA or other accounts, where the technology has no special status and the technology aspect of the interaction would have been outside the theoretical framing rather than intrinsic to it.

Theory adaptation

A process that starts with borrowing but then transforms the borrowed theory is theory adaptation. In this case, the researcher is led to propose some change in the theory construct to account for data emerging from CALL research results or potentially from observations prior to the actual research. Smith (2003) (see Levy, Chapter 7 this volume) provides an example of the former in a CMC study: he finds that the special character of the synchronous, text-based chat environment requires him to extend the established negotiated interaction framework of Varonis and Gass (1985). Hubbard (2012) discusses a number of such examples where the results of the CALL study have shown that the traditional ‘face-to-face’ theory requires some emendation.

Theory ensemble

Levy and Stockwell (2006) observe the growing use of multiple theories within a single study to capture a range of perspectives that a single theory cannot, especially in studies involving development or design. Capturing the notion that these theoretical sources combine while maintaining their individuality, we label this a theory ensemble (see also Levy, Chapter 7 this volume), another category absent from the Hubbard (2009) typology. In some respects, a theory ensemble is akin to an adaptation, but rather than transforming the initial theory, it is enriched with additional sources, either before or after the study. Because no single theory is perceived as rich enough to meet the needs of the research, teaching or development project, rather than change the theory, different sources are drawn on for different purposes. The study by Cornillie, Clarebout and Desmet (2012) in the final section of this chapter is a clear example of this process, combining the differing perspectives and theoretical traditions of language learning and gaming in a coherent way. Coherence is important here: care must be taken by researchers and developers not to simply string together potentially conflicting or incompatible theoretical sources just because each might seem to say something interesting.

Theory synthesis

Taking this process one step further is a theory synthesis, where insights from two or more sources are combined into a single theoretical entity. Plass and Jones (2005) offer an example of such a synthesis, integrating elements of Chapelle’s interactionist account for CALL with Mayer’s Cognitive Theory of Multimedia to produce a unified theoretical framework for using multimedia in second language teaching. One could argue that a theory ensemble and a synthesis are basically the same sort of ‘collection’ process, but we believe that would miss a critical distinction. The outcome of a synthesis is an object of sorts – a new theory, framework or model – as in Plass and Jones (2005). An ensemble, by contrast, does not imply either permanence
or generality – the collection is made in pursuit of understanding a particular phenomenon or to guide in the development of a given project. This leaves open the possibility that an ensemble could evolve into a synthesis through reuse in other research studies or development projects either by the original author or others.

**Theory construction**

All of the previous processes involve taking one or more specific theoretical entities and building on them directly. A further category, though relatively rare to date, is *theory construction*, where a ‘native CALL’ theory is produced. Although informed by prior theories, a constructed theory has a certain independence lacking in its predecessors. Oller’s (1996) proposal for technology-assisted language learning is one example; another is White’s (2005) proposal for a learner-based theory of distance language learning.

**Theory refinement**

Finally, operating in parallel with most of the preceding categories is the process of *theory refinement*, the idea that, in line with other scientific tradition, theories improve (or in some cases fall) as more data come to support or refute them. As the field moves forward and certain theoretical options become more established, we can expect to see growth in this area.

The preceding categories reflect a rough continuum from greater to lesser dependence on the original sources and conceptualisation. Although it might seem that constructed theory is a desirable goal for the field in the long term, it is not clear whether that is indeed the case. As technology becomes more integrated and normalised (Bax 2003, 2011), the need for separate ‘theories of CALL’ may disappear. Indeed, Egbert, Hanson-Smith and Chao (2007) claim ‘educators do not need a discrete theory of CALL to understand the role of technology in the classroom; a clear theory of SLA and its implications for the learning environment serves this goal’ (p. 3).

To conclude this section, it is important to note that the discussion here has focused on understanding how theory is incorporated into CALL rather than how well. We have explained that theories may be absent, borrowed singly, assembled in an ensemble, instantiated, adapted, synthesised and even created. However, regardless of the process involved, a theory or model may be misappropriated or misapplied in a study due to a lack of care or understanding on the part of the author. In this vein, Colpaert (2004) notes the importance of theoretical underpinnings being ‘valid, relevant, and applicable’ (p. 462). In addition, a theory or model may simply be *invoked* to lend credibility to a study. This can occur, for example, when a theory is named as a ‘guide’, often in early parts of the paper, but does not seem to feature explicitly in either the research or development design process. Although a step beyond atheoretical CALL in principle, the presence and impact of the theory is largely invisible beyond that invocation. Although there is some justification for this action if the theory indeed helped shape the author’s motivation and choices, this is often difficult to discern. What is apparent is that in a research project, an invoked theory is neither the object of study nor the lens through which study data is collected, analysed and interpreted. Similarly in a development project, there is no explicit mapping of an invoked theory’s constructs onto design processes, decisions or evaluation.

The more gratuitous sense of invocation resonates with the concept of *theory buffet* introduced by Levy and Stockwell (2006). ‘With so many theories available, it is easy to find one or two that more or less fit CALL artefacts or plans that have already been completed, making...
Theoretical dimension cannot simply be a gap to be filled in a proposal or paper. It should be integrated and articulated in a way that leads to greater coherence and clearer understanding than would result if it were absent.

Theory in CALL research

In discussing theory within this field, it is important to consider that theory as used in research is not necessarily the same as theory supporting practice. Along these lines, Levy and Stockwell (2006) draw distinctions in the role of theory for design, teaching and research in CALL. This section and the one that follows draw on some of those insights.

Despite the wide range of theoretical sources from various disciplines described in the previous section, theories from second language acquisition can be said to have had a more central role than others. Indeed, Chapelle (2009) argues that a variety of SLA theoretical approaches deserve consideration by CALL researchers and developers. She discusses four general orientations, each of which collapses a number of related theories and models under its label: cognitive linguistic (e.g. universal grammar), psycholinguistic (e.g. input processing), human learning (e.g. skill acquisition theory) and language in social context (e.g. complexity theory). She speculates on the implications of thirteen specific theoretical approaches for CALL. For example, in discussing processability theory, she notes that it ‘provides a basis for sequencing the teaching of grammatical structures in individualized learning’ (Chapelle 2009: 744).

Although a number of theories, frameworks and models, including those mentioned by Chapelle (2009), have been used to motivate CALL projects and to provide a basis for research and evaluation, three in particular stand out: the interaction account, sociocultural theory, and constructivism. Each is discussed in more detail in the following sections.

The interaction account of SLA

The interaction account (IA) emphasises the role of interaction in second language development (Long 1996). It incorporates certain central processes such as the negotiation of meaning, in which the learner and interlocutor(s) engage in an ongoing process of interactional adjustments (Pica 1991). The IA focuses upon learning interactions that by necessity involve two or more people, or a person and the computer (Chapelle 2003). A number of CALL researchers have argued for the IA as an appropriate foundation for CALL research, notably Chapelle (1998, 2005). Chapelle (2003: 94) notes that CALL studies have applied theoretical concepts from the IA for a variety of purposes: for example, the IA construct of ‘input modification’ – simplifying or elaborating to make input more comprehensible – has been associated with actions from computer programs such as providing subtitles for listening or definitions from electronic dictionaries or glossaries on demand from the learner. In particular, the IA has been extensively referenced as a theoretical base in CMC-based CALL (often simply borrowed rather than instantiated in the sense described earlier), especially in projects that involve email and chat as a basis for learner interaction and exchange (Darhower 2002). Any setting where synchronous or asynchronous communication occurs can draw on the IA for guidance, including text-chat and voice-chat,
either used independently or embedded in other programs (e.g. virtual worlds and games), as well as voice over Internet protocol tools such as Skype.

**Sociocultural theory**

Vygotsky claimed that learning resulted from social interaction rather than through isolated individual effort, and that engagement with others was a critical factor in the process (Vygotsky 1978: 89). In his view, learning was at first social (intermental), and only later individual (intramental). According to Lantolf (1994), Vygotsky’s fundamental theoretical insight was that ‘higher forms of human mental activity are always and everywhere, mediated by symbolic means’ (p. 418). The preeminent tool for mediation is language. But language is not the only tool for mediation. Donato and McCormick (1994) provide a helpful elaboration: ‘For Vygotsky, the source of mediation was either a material tool (e.g. tying a string around one’s finger or using a computer); a system of symbols, notably language; or the behavior of another human being in social interaction’ (p. 456). From a sociocultural perspective, it is via these different forms of mediation that cognitive change or learning occurs (see also Darhower 2002).

In the context of the present discussion, two points should be emphasised. First, with regard to material tools, technologies mediate communication and thereby cognitive change differently. From the landline phone through email, text messaging and Skype, the technology itself shapes the interaction in particular ways. Each technology has its own affordances that govern differentially the ways in which interactions occur (see Hutchby 2001; Smith 2003). The technology does not determine the interaction, but its attributes do help shape them. When sociocultural theory is applied in CALL, it often reflects the process of theory instantiation described earlier precisely because the mediational role of the technology is an integral part of the study. Second, with regard to social interaction, new technological means allow new and different forms of social interaction to occur, both online and in the classroom. The terms ‘situated learning’ and ‘communities of practice’ derive from this perspective and are often used to highlight the importance of active learner participation in the community of the classroom or in online community settings (see Donato and McCormick 1994).

In CALL, an appeal to the work of Vygotsky and his successors, notably Leontiev and Engeström (see Blin, Chapter 3 this volume), has been made to support cooperative or collaborative learning, teachers working with students on purposeful activity and learning in social groups and communities of practice (Warschauer 2005). As McDonell (1992) observes, Vygotsky’s theory supports a collaborative approach and cooperative learning, because it ‘analyses how we are embedded with one another in a social world’ (p. 56). Now, of course, social worlds extend into the virtual worlds of gaming among numerous other complex modes of online social interaction (e.g. Lee 2009; Peterson 2012).

**Constructivism**

In a seminal article on constructivist theory, Phillips (1995) describes constructivism as a large-scale movement and system of beliefs: he also highlights its diversity and its many interpretations. Despite this diversity, he acknowledges the common ground of the movement: ‘human knowledge – whether it be the bodies of public knowledge known as the various disciplines, or the cognitive structures of individual knowers or learners – is constructed’ (p. 5), contrasting with the more traditional view of transmission of knowledge. Yet beyond that basic statement, interpretations tend to differ and follow rather divergent paths.
These understandings and widely differing interpretations of constructivism have carried over into the CALL area (Felix 2002). In a special issue of the *TESOL Journal* titled ‘Constructing Meaning with Computers’, the editors speak of cognitive and social constructivism (Healey and Klinghammer 2002). In essence, the cognitive constructivist describes the mind in terms of the individual; the social constructivist describes the mind as a distributed entity that extends beyond the bounds of the body into the social environment. Healey and Klinghammer also emphasised the centrality of the learner in the learning process and the importance of the teacher in creating motivating authentic activities that involve investigation, discussion, collaboration and negotiation. Each author in that special issue draws rather differently on the constructivist idea, often listing overlapping sets of principles that underpin the individual constructivist CALL learning environments they are creating.

**The role of theory in research**

Theory guides and shapes research in many ways, but perhaps one of its most important roles concerns its influence on the ways in which the researcher sees the problem. Through theory, the researcher is guided not only towards particular ways of formulating the research problem initially, but also towards ways of investigating it, through the choice of terminology and constructs, research method and procedure, data collection procedures and mechanisms of analysis and interpretation: each are both directly and indirectly suggested by theory. This role of theory in research is described eloquently by Neuman:

> Theory frames how we look at and think about a topic. It gives us concepts, provides basic assumptions, directs us to the important questions, and suggests ways for us to make sense of data. Theory enables us to connect a single study to the immense base of knowledge to which other researchers contribute. To use an analogy, theory helps a researcher see the forest instead of just a single tree.

(*Neuman 2003: 65*)

In other words, the theory drives and shapes the whole research conceptualisation and process. It also sets the boundaries and largely governs points of focus, the concepts or constructs to be included and excluded, and of those included, those foregrounded and those that remain in the background.

An instructive way to appreciate the ways in which theory shapes the researcher’s thinking is to look at two studies undertaken in similar settings, and with broadly equivalent participant profiles and data sets, but differing in their theoretical orientations. A suitable example in CALL drawn from Levy and Stockwell (2006) compares and contrasts two studies in an online chat environment. Fernández-Garcia and Martínez-Arbelaitz (2002) used the interaction account to guide them; Darhower (2002), in contrast, looked at the interactional features of synchronous CMC chat from a sociocultural perspective. The two contrasting theoretical approaches illustrate well the choices that confront contemporary researchers when no single language learning theory is preeminent and when more than one theoretical account lends itself to the job of description and explanation. The different theories exert their influence in the way they encourage the researcher to structure and process the data in particular ways, and then to determine what mechanisms of analysis and interpretation are used to, in our case, provide a basis for an argument that says ‘learning’ has occurred.

Levy and Stockwell (2006) discuss essential differences between these two theoretical positions and their implications. Guided by the sociocultural approach, Darhower’s study was driven...
by a concern with learners’ levels of active participation in a community of practice. As such, it focused upon ‘specific interactional features’, notably ‘intersubjectivity’ and ‘off-task discussion’. Intersubjectivity refers to the shared perspective experienced by participants: it is an interactional feature that needs to be maintained if effective communicative action is to continue. Within the sociocultural orientation, such interactional features are key because they speak to the learner’s level of participation in the online community. The quality and degree of participation are essential in generating cognitive change (see earlier discussion).

Thus, Darhower is interested in the maintenance (or otherwise) of intersubjectivity and the ways learners participated and managed their interactions – for instance whether they chose to stay on-task or go off-task, and if they went off-task, what topics they chose to discuss. Sometimes conflicts occurred – also of interest to Darhower – when one learner wanted to stay on-task while the other did not. With his theoretical position, this movement between on-task and off-task work is fundamental to the way social cohesiveness is built up and maintained. Thus, off-task work is firmly in the frame and remains very much a feature of this study: essentially, it is treated equally with on-task work. As Darhower says: ‘Sociocultural theory emphasizes that the locus of learning is . . . a product of social interaction with other individuals’ (2002, 251); therefore constructs such as intersubjectivity and off-task discussion become central when sociocultural theory is employed to guide research.

In contrast, Fernández-Garcia and Martínez-Arbelaitz (2002) only refer to the term ‘task’ four times in their paper, and when it is used, it is referred to in its general sense as would be found in a dictionary. The authors show no interest in the possibility of off-task discussion: it is not a salient feature of their theoretical framework, and the tacit assumption is made that students remain on-task throughout the activity (whether true or not, we do not know). The construct of intersubjectivity is also not a concern. Instead, for Fernández-Garcia and Martínez-Arbelaitz (2002), the theory dictates that constructs such as ‘negotiation of meaning’ (interaction by two speakers aimed at mutual understanding) are central and, additionally, more technical interpretations of the idea of negotiation in language learning, such as ‘negotiation of comprehensible input’ (ensuring that a word, phrase, etc. is understood), ‘negotiation routines’ (patterned ways of interacting in the pursuit of meaning) and ‘pragmatic negotiation’ (interacting to understand the intended functional meaning rather than just the literal one). These terms derive directly from the particular theoretical orientation that drives the research study.

In both studies, the theoretical point of departure sets the field of view and the mechanisms of interpretation. The theory defines the key constructs, the data to be collected and the way in which the argument that learning has occurred will be made. Both use theory to support their rationale and justify their research, and both draw on theory to identify desired features in the chat room interaction. Darhower (2002) is looking for evidence of the intersubjectivity and social cohesiveness hypothesised in sociocultural theory to be important for language development and learning and the development of sociolinguistic competence. Fernández-Garcia and Martínez-Arbelaitz (2002), on the other hand, are looking elsewhere for evidence in their transcripts seeking signs of interactional modifications and modified learner output which are regarded as key indicators of learning in the IA. The two theoretical bases led the researchers in different directions.

Theory in CALL practice

When theory is used for teaching and CALL, it is often used as a guide rather than as a prescription. Instead of drawing upon one theory exclusively, language teachers are more likely to draw on a number of theories simultaneously. Thus, there is a distinct difference between the
way in which theory is used in teaching, and similarly in design and development, compared to the single theoretical framework of many research studies. Following the typology presented previously, this means that CALL theory in practice is more likely to be an *ensemble* or a *synthesis*.

This approach to the nature, use and application of theory for teaching and CALL is examined by Doughty and Long (2003) in their very useful discussion of task-based language teaching (TBLT). They describe TBLT as ‘an embryonic theory of language teaching, not a theory of SLA’ (p. 51). They continue:

> And whereas theories generally strive for parsimony, among other qualities – to identify what is necessary and sufficient to explain something – a theory of language teaching seeks to capture all those components, plus whatever else can be done to make language teaching efficient. Language education is a social service, after all, and providers and consumers alike are concerned with such bread-and-butter issues as rate of learning, not with what may or may not eventually be achieved through a minimalist approach motivated exclusively by theory of SLA.

*(Doughty and Long 2003: 51)*

So TBLT, as a theory of teaching rather than of language acquisition, is informed by a number of theoretical sources that blend into one another. Doughty and Long (2003) use theory to derive ten methodological principles, or ‘language teaching universals’, for TBLT, and these in turn are converted to pedagogical procedures, according to contextual factors determined by the teacher, the learners and the learning context – the online environment in this case. Thus, the role of theory here is to provide a principled foundation, inasmuch as current research findings are able, for the methodological principles (see also González-Lloret 2003).

A good example of a more broadly defined set of guidelines that are drawn from a number of theories rather than a single one is that presented by Egbert et al. (2007). For their ‘theoretical framework’ (p. 4), they identify eight optimal *conditions* for CALL and use these conditions to organise the content of their book, e.g. (2) learners interact in the target language with an authentic audience, (6) learners are guided to attend mindfully to the learning process and (8) learner autonomy is supported. These eight conditions are drawn from a number of theoretical accounts and research studies which the authors argue are ‘the most widely researched and supported in the literature and make up a general model of optimal environmental conditions’ (Egbert et al. 2007: 4). Within our model, this could be considered a *theory synthesis*, though the sources are more varied and the connections less explicit than in Plass and Jones (2005).

This theoretical diversity stands in contrast to the seven *hypotheses* that derive directly from the interaction account, described by Chapelle (1998: 23–25), for example (1) the linguistic characteristics of target language input need to be made salient, (4) learners need to notice errors in their own output and (6) learners need to engage in target language interaction whose structure can be modified for negotiation of meaning.

For Chapelle, the IA is used to provide a set of explicit assumptions for CALL research and practice. Chapelle’s list of hypotheses is narrower and more tightly focused on language interaction than the earlier list. Neither is necessarily better than the other, but they do speak to practice in rather different ways, one being broader and more encompassing, the other more finely targeted and focused. Both have a role to play. Perhaps most interestingly, although both claim to be guidelines for CALL, neither has any direct reference to technology in their core generalisations. They are borrowed from theory and research in SLA and transported into the CALL setting without incorporating any explicit role for technology.
Nevertheless, these two contrasting positions are helpful in understanding how theory can relate to practice. The position held by Egbert et al. reflects a trend in recent CALL articles to draw upon a number of theoretical perspectives simultaneously when developing a conceptual framework for online teaching and learning. Perhaps multiple theoretical perspectives are an acknowledgement that no single theory is preeminent in describing the processes of language learning; or it may indicate that no single theory is sufficiently powerful to provide a broad and principled set of guidelines for the many decisions that need to be made in creating online teaching and learning environments.

Current trends and future directions

We would really like to end this chapter on a note of surety, where we could point to a particular theory or cluster of theories and say ‘here is the best answer’, or ‘this one looks like the best bet for the future’, but to do so would distort the reality of the matter. Scholars new to the field (and indeed some who are not so new) who are looking for the ‘truth’ that theories seem to promise, will not find it.

As noted previously, CALL projects are regularly influenced by multiple theoretical perspectives, what we have called theory ensembles. For example, Levy and Stockwell (2006: 134) noted the multiple theoretical sources for the *Lyceum* distance language learning environment, an audio-visual conferencing system developed by the Open University in the UK and used extensively for language learning purposes. They included the interactionist account, sociocultural theory, constructivism, situated learning and multimodality. Some of these theories and their proponents clash with one another in the research-centred SLA arena, yet in the pragmatic development of *Lyceum*, the different theoretical perspectives spoke to distinct elements and processes within the learning environment that was being created. Such learning environments are multifaceted and complex, so it should perhaps not be surprising to learn that multiple theoretical influences, even those that might on the surface appear incompatible, are referenced to inspire them.

To begin to understand how this trend of multiple theories is being realised, it is instructive to examine some recent examples closely. Consider the six research studies on digital gaming described in the *RecALL* Special Issue, ‘Digital Games for Language Learning – Challenges and Opportunities’ (Cornillie, Thorne and Desmet 2012). Each study references multiple theories and each theory is called upon for different reasons. For instance, the first study (Cornillie et al. 2012) discusses the value of ‘interweaving theory in the SLA and GBL (game-based learning) literatures’ (p. 258). Their work points to the essential conundrum found at the centre of the design of all language learning games: ‘between learning and playing’. It is this core problem that engages Cornillie and his research team as they aim to design corrective feedback such that learning is facilitated while, at the same time, the high levels of interactivity and engagement in gameplay are not interrupted. Managing both of these goals simultaneously is not straightforward. The circumstances call for a balance between instruction and play in designing corrective feedback (CF), and the study draws on the two theoretical bases accordingly. This project also includes a number of further theoretical sources, including the cognitive mediational paradigm (p. 260), 4-Component Instructional Design Model (p. 265), self-determination theory (p. 262) and flow theory (p. 262), the latter being highly relevant in the design of the game. Each theory is included to serve a particular purpose.

Two more studies in the special issue are worthy of deeper consideration. Both involve using the massively multiplayer online (MMO) game *World of Warcraft (WoW)*. The first study, by Zheng, Newgarden and Young (2012), uses an ensemble of theories or pseudotheories to motivate the project, including communicative project theory, multimodal analysis, languaging,
situated learning, values-realising theory and an ecological perspective, among others. A particular focus is on how L2 learners coordinate gameplay and manage ‘multiple perspectives and dynamics in a given moment of action’ (Zheng et al. 2012: 340). The complex nature of both the environment of the game and the activity give rise to the activation of a number of different theories employed for different purposes. The second study, by Rama et al. (2012), examined the affordances for second language learning in *WoW*. It used sociocultural theory as a central pillar in a blend with notions of ‘affinity spaces’ and goal-directed cooperative action. Here theory is used to help make observations about the gaming environment, especially on its affordances for language learning, forms of participation, and its effectiveness as an arena for building and sustaining relationships (intersubjectivity).

In these varied examples on the uses of sophisticated games for language learning we see many theories in play (excuse the pun). The context of the language learning game is not the same as the typical teacher-fronted face-to-face language classroom. Care needs to be taken, therefore, in using theories developed and tested on face-to-face settings in game-based learning environments. In fact, a broader principle applies here. The default position for the researcher should always be that the online learning environment is substantively different from – not the same as – the classroom setting. Interacting via a screen, often with several windows open at the same time, presents the teacher and learner with multiple options for simultaneous interaction (e.g. interaction via the chat window while listening to the teacher and looking at a shared whiteboard, as in a typical distance learning setting). Theories emerge in new combinations according to the affordances of these novel language learning environments. Therefore, as such settings emerge and evolve, and as ‘gamification’ increases in the CALL literature, we are likely to see more examples of this multithoretical approach to research and development. Recent special issues of the *CALICO Journal* (30.2, 2013) on learner preparation and *Language Learning & Technology* (17.3, 2013) on mobile-assisted language learning (MALL) attest to the fact that gaming is just one of several emerging topics enriching the theoretical inputs to the field.

In this chapter, we have presented a working definition of CALL theory and shown that it draws on many sources and an expanded framework for classifying how theory is integrated into various CALL studies. As a part of reading and interpreting others’ work in this field, we believe it is important to understand and identify the process through which theory is brought to bear on whatever research question or practical issue the study is addressing. More importantly, in bringing theoretical orientations and constructs into one’s own work in CALL, it is essential to stop and reflect deeply on why those orientations and constructs are there. Theories should not be chosen lightly, or simply because they happen to be in vogue at the time. Ideally, theory should play a foundational role in the study and be fully integrated into its goals, constructs and design. Beyond the increasing use of theory ensembles in design/development and teaching, there is clearly a need for more central consideration of the role of the technology itself as something other than a neutral entity. As Chapter 3 (Blin, this volume) demonstrates, options such as activity theory that have a place within their frameworks for the technology are already showing promise for meeting this need. What will be interesting to see over time is what types of progress can be made in establishing useful theory ensembles and in increasing the instances of theory adaptation, synthesis, instantiation and perhaps construction. It is the theoretical innovation in these areas that will ensure the field remains dynamic and relevant.

To conclude this chapter, we would like to emphasise our position that the incorporation of technology in language teaching and learning, whether called CALL or something else, should continue to be influenced and guided by theory. The presence of theory provides the frame through which the complexity of the object under study can be coherently interpreted and the means to reach out beyond the single, context-specific research study. Whether theory in this
field ever reaches the explanatory level aspired to in rationalist positions remains an open question, but it is clear that theory can play a role in illuminating teachers’ and learners’ experiences and in pointing the way towards more promising tasks, applications and environments.

Further reading


Chapelle approaches CALL theory from the perspective of SLA and the interactionist approach. As far as theory is concerned, chapter 3 provides important foundational concepts and a particular elaboration that has been employed in subsequent research projects. Her distinction between judgemental and empirical evaluation is key, as are her five principles of evaluation that emphasise the importance of incorporating findings and SLA theory when conceptualising new research projects. Her six criteria for CALL task appropriateness are especially helpful for research aimed at task evaluation.


In this edited volume, many of the current options for CALL theory are introduced, chapter by chapter. More recent perspectives are included such as flow theory and design-based research, as well as more established areas such as interactionist SLA theory and sociocultural perspectives. In addition, Part 1 addresses some important background issues, some of the questions and dilemmas that need to be addressed, and ways to identify criteria that help ensure theory application is effective.


This study of theory in CALL is useful for providing a look into how the term was incorporated into published studies in one CALL journal from the early 1980s through 2007. Based on a corpus of work comprising 166 articles where the term theory appears in the body of the text, the paper offers an analysis of the number and type of theories in use. The study is illuminating for the reader who wishes to explore and understand the particular ways in which theory was elaborated and applied in CALL during that quarter century.


The first part of Volume 1 in this four-volume series provides valuable points of departure for those wishing to orient themselves to the ways theory in CALL has been understood. Two chapters examine different roles for the computer (Higgins: magister/pedagogue; Levy: tutor/tool), and another discusses the broad phases through which it has progressed (Warschauer and Healey: behaviourist, communicative, integrative). The relationship between research and practice (Garrett) and the ‘normalisation’ concept (Bax) further illustrates some of the unique qualities of the field. The final contribution by Chapelle draws from theory and instructed SLA research to examine how theory is employed to elaborate and guide practice. Though the contributions are disparate, these six chapters provide a complementary and thought-provoking set of perspectives on theory and CALL.


Chapter 5 in this volume presents a detailed overview of theory use in CALL. It pays particular attention to the qualities and features of CALL and theory use, especially in relation to closely associated fields such as second language acquisition (SLA). As a result, it not only considers research studies motivated by a single theoretical perspective (e.g. interactionist theory and sociocultural theory), but also studies and projects that use two or more theories in their design and development (e.g. Cornillie et al. with games). Continuing this exploration of the various roles theory can play, the chapter also considers how theory may be applied differently according to its role and function, as in theory for design, theory for teaching and theory for research. The discussion highlights some of the special qualities of CALL as far as theory application and use is concerned.

References


Theory in computer-assisted language learning


Philip Hubbard and Mike Levy


