

# 1 Introduction to the *Handbook of Technology and Second Language Teaching and Learning*

---

CAROL A. CHAPELLE  
AND SHANNON SAURO

The *Handbook of Technology and Second Language Teaching and Learning* was conceived in response to the fact that technology has become integral to the ways that most language learners in the world today access materials in their second and foreign language, interact with others, learn in and out of the classroom, and take many language tests. In the title for this volume, we have used the expression “second language” as shorthand for all of the many language teaching and learning situations that include both children and adults learning additional languages beyond their mother tongue (which may be third, fourth, or more languages for them) in settings where the language being studied is the medium of daily life, education, business, or only a subject in the language classroom. We include both learning and teaching in the title to make explicit our concern with the two related but distinct areas—the pedagogy that teachers and materials designers are preoccupied with and the processes that students engage in both in and out of the classroom.

For the many diverse learners, the use of computer technology for all facets of second language learning has dramatically increased as the reach of the internet continues to spread, providing access to social media, reference materials, online instruction, and more. The implications for language teachers, learners, materials developers, and researchers are extensive. Our goal in creating the *Handbook of Technology and Second Language Teaching and Learning* was to communicate to a broad range of readers, within the field and beyond, the shape and texture of the technology-rich environments that language learners inhabit today as well as the relevance of these environments for second language teaching and learning. The chapters in the *Handbook* demonstrate that technology has added multifaceted new dimensions to teaching and learning, which include new ways of teaching every aspect of language, new pedagogical and assessment approaches, as well as new ways of conceiving and conducting research and development.

Reference works are needed to gather and synthesize the scholarly treatment of these dynamic practices and research that are so central to the profession. In view of the central role it plays, technology and language learning needs to be represented among the other areas of study in applied linguistics through its appearance in major reference works such as the Wiley-Blackwell Handbooks in Applied Linguistics. In fact another such handbook, *The Routledge Handbook of Language Learning and Technology* (Farr and Murray 2016) was recently published in the Routledge Handbooks in Applied Linguistics. Technology and language

learning is also well-represented in the *Encyclopedia of Applied Linguistics* (Chapelle 2013) with its own section (edited by Thomas Cobb) as well as entries that include technology-related issues across the entire *Encyclopedia*. With these major reference works now available, our goal was to provide another, different point of entry into this area of applied linguistics for the broad range of learners, teachers, materials developers, and researchers who want to learn more about this as an area of research and practice. Anyone with an interest in languages and cultures today has recognized that technology has affected their potential for access to more and more of their language interests. This recognition can evolve into professional knowledge and action when personal interests meet the history, practices, theory and research of the profession.

The *Handbook* was designed to create the opportunity for such meetings to take place. Its organization reflects the goal of inviting in and engaging readers with little professional knowledge of how technologies are transforming practices. The first section contains chapters that explain the ways that technology is integrated in the teaching and learning of specific aspects of language knowledge and skills, most or all of which are familiar to all readers. Each of these chapters includes how technology-based tutors, tools, and pedagogy contribute to language development. The second section builds on discussion of methodology for teaching and learning to identify new pedagogies that have been developed by exploring the language and communication affordances of various technologies. Integral to but distinct from pedagogy, the third part contains chapters pertaining to issues of language assessment that are important in teaching and learning practice. Broadly speaking, the fourth section addresses the areas that converge in research and development of technology-mediated pedagogy for language learning. The final chapter provides an analysis of the contribution these chapters make to the profession and a look toward their implications for the future.

The remainder of this chapter provides a more detailed introduction of the chapters in the *Handbook* to situate each one within one of these four areas of language abilities, pedagogies, assessment, and research and development. As background to the four areas, the first chapter provides a historical account of the development of language learning and technology as an area of practice and research in applied linguistics. One of the pioneers, Sue E. K. Otto, who worked in research and development in computer-assisted language learning (CALL) at the University of Iowa for over 40 years, provides a chronological view of how technologies have intersected with and served in the evolution of practices in language teaching and learning. Her broad view begins with the printed text, drawings, photos, audio, and video technologies that teachers and learners have taken for granted for years. Otto describes the gradual evolution of recording and delivery formats, for example, that have given way to today's digital, computer-based formats that are contributing to evolving language pedagogies. From photos passed around the classroom, to those broadcast on Twitter, this chronology sets the stage for the many technologies that come into play in the rest of the volume. New technologies seldom replace the old; instead, they create more options for technology users. The past practices therefore hold their place with the present technologies, inviting language learners and teachers to explore how to select, mix, and create new practices using them all. The new practices that appear to be most influential are included in this *Handbook*.

## **Part I: Language teaching and learning through technology**

Most learners studying another language hope to be able to use the language to communicate with other speakers. Their end goals are communication, but most teachers and learners approach language teaching and learning through a multi-strand process targeting particular areas of language knowledge and skills. The first section is divided according to these areas of language abilities that readers will recognize as forming the basis of most instructional

programs: grammar, vocabulary, reading, writing, listening, speaking, and pragmatics and intercultural competence. Each of these chapters reviews practices for use of technologies as well as the theoretical and research bases for these practices.

In Chapter 3, Trude Heift and Nina Vyatkina provide an overview of technologies for teaching and learning L2 grammar by focusing on four distinct CALL environments: tutorial CALL, intelligent CALL (ICALL), data-driven learning (DDL), and computer-mediated communication (CMC). They situate these approaches to grammar teaching and learning within discussion of pedagogical approaches to teaching and learning L2 grammar more broadly and with theoretical perspectives from second language acquisition. They provide examples of each of the four types of technologies and describe the research studies that have focused on learner feedback in Tutorial CALL, ICALL and CMC, and on learner autonomy in DDL. Throughout their examples, it is clear that grammar cannot be seen as a separate or isolated activity. In particular, readers will see the integration between grammar and vocabulary learning in this chapter and in the next one, which covers vocabulary learning.

In Chapter 4, Qing Ma describes how new technologies have expanded pedagogical options for teaching and learning second language vocabulary. She describes the affordances technology provides in view of a memory-based model of L2 vocabulary learning. She introduces software tools for desktop and mobile learning technologies, explaining their rationales in view of the vocabulary learning model. She draws upon the theory and research of self-regulated learning to describe how teachers can offer strategy training that helps students make the most of technology-mediated vocabulary learning.

In Chapter 5, Meei-Ling Liaw and Kathryn English introduce second language reading technologies that support second language reading development. The description of technologies is based on their theoretical conception technology-assisted second language reading as a process that engages particular cognitive processes and strategies involved in second language reading. An important characteristic of second language reading is that it must extend beyond the classroom; students need to read materials that are interesting to them outside the classroom to get sufficient exposure and practice. Thus, the primary challenge for current language teachers that the authors identify is how language educators can leverage students' intense use of social media and consumption of a vast and diverse quality of reading materials on the Web for learning second language reading. The chapter ends with suggestions for applying technologies to help second language learners to engage in independent, autonomous reading that may help promote their active global participation in the digital age.

Continuing to examine pedagogical practices for teaching the written language, Chapter 6, by Zhi Li, Ahmet Dursun, and Volker Hegelheimer explores the implications for second language teaching and learning that are based upon the reality that all writing practices today are shaped by new technologies. Li, Dursun, and Hegelheimer introduce three types of technologies for teaching and learning second language writing: Web 2.0 applications, automated writing evaluation systems, and corpus-based tools. The authors explain that the effects of these tools have begun to be explored in research on writing, and they provide an overview of the research results for each of the three types of tools. The chapter concludes with a description of promising but not yet widely incorporated technologies for second language writing research and a discussion of the directions for future research and development of technologies and pedagogies for writing.

Chapter 7 shifts from the written to the spoken with Philip Hubbard's discussion of CALL for L2 listening. Hubbard traces the development of technology and technology-enhanced listening activities for second language learning, paying particular attention to the affordances and mediating characteristics of different tools as well as the potential they hold for facilitating comprehension and learning. His overview of approximately 20 years of research

on technology for L2 listening draws upon a typology of four help options found in different learning and communication technologies that have been examined for affecting listening in a second language. Looking forward, Hubbard concludes with a call for the development of curated collections of listening material assembled from freely available online materials that could be organized by L2 listening experts in a manner that reflects the language proficiency needs, interests and digital skills of L2 learners.

Moving from language comprehension to production in Chapter 8, Robert J. Blake discusses CALL for support of students' learning to speak a second language. Blake describes two types of technology-assisted activities: tutorial exercises and CMC. Blake's analysis of the principles for designing good CALL activities are consonant with best practices for teaching oral language in the classroom; they include providing opportunities for the negotiation of meaning, focus on form, and a heightened sense of learner autonomy and agency. CALL activities can be used to foster all aspects of second language speaking proficiency including the dimensions of accuracy, complexity, and/or fluency, depending on the type of assigned task. Blake notes that students no longer need to rely on classroom activities to engage in these speaking activities because they can use CMC tools to exchange text, sound, and video in a variety of formats, each with its own set of affordances.

In Chapter 9, Julie Sykes describes how technology has changed and expanded the teaching of pragmatics, which refers to the expression and understanding of meaning in the contexts of language use. Pragmatic abilities are important for meeting the goals of intercultural competence because they govern the selection of how and what to communicate to a particular person in specific contexts. Many contexts where interlocutors use their second languages are created and mediated by the very technologies that may help learners to develop their second language pragmatic abilities. Sykes explores ways in which technology can facilitate the multilingual online and face-to-face interactions, provide opportunities for meaningful teaching and learning of interlanguage pragmatics, and extend professional knowledge of pragmatic behaviors from a transnational perspective.

Together these chapters introduce the technologies that are being used to address specific areas of the big project of learning to communicate in a second language. The following section builds upon these pieces to describe pedagogical tools, configurations, and approaches that draw upon combinations of affordances of one or more of these technologies for teaching language.

## **Part II: Innovation at the Technology-Pedagogy Interface**

This section develops the new issues, concepts and practices that have emerged at the interface of technology and language pedagogy. Each chapter takes a particular vantage point on pedagogy that assumes a new character and significance in view of the options provided by technology. Accordingly, each chapter provides an extended definition of pedagogy issues with examples showing how the technology creates new practices or transforms existing ones for second language teaching. Summaries of research in each area present findings to-date about the effects on learning and directions for future research and development.

In Chapter 10, Cynthia J. White situates technology within a history of distance learning which originated years before the digital technologies that are widely used in distance education today. She identifies distinctive features of distance learning as well as practices and forms of enquiry into distance language teaching with technology. The technologies she sees as important for shaping and expanding distance education today are CMC, audiographic- and video-conferencing, learning management systems, and telecollaboration. She argues that the development of quality distance language education relies on increasing professional knowledge in many of the areas covered in the *Handbook*, including task design, assessment of student learning, teacher education, and evaluation of distance learning programs.

Blended learning, defined as a combination of face-to-face classroom meetings and computer-mediated learning, is commonplace in many language classes today. Such configurations arise out of teachers' desire for innovation, by mandate, or because of circumstances that have made blended learning normal practice. In Chapter 11, Maja Grgurović demonstrates why some researchers are looking at blended learning as anything but ordinary. Grgurović's summary of the recent research investigating blended language learning from 2006 through 2014 uncovers studies examining comparisons with other forms of learning, teacher perceptions, learner perceptions, specific technology tools, and course implementation. Grgurović argues that the research results warrant developing a better understanding of blended language learning through theoretical grounding of studies, better approaches to assessing effectiveness, and engagement with the teachers' and students' needs.

Potentially instrumental in both distance and blended language learning, telecollaboration has become an important component of many second language classes, particularly for intercultural learning. In Chapter 12, Melinda Dooly defines telecollaboration in education as the use of the computer and/or other digital tools to promote learning through social interaction and collaboration. Dooly outlines pedagogical approaches used in telecollaboration for language learning including task-based language teaching, project-based language learning, and communication-oriented language teaching. She emphasizes the value of telecollaborative exchanges for developing learners' autonomy and providing opportunities for cross-cultural interactions. She outlines the considerable opportunities for future research and practice in telecollaboration.

Virtual environments and gaming are two other areas that have been the focus of research in many subject areas, but authors in the *Handbook* describe how these two domains have been explored for language learning. In Chapter 13, Randall W. Sadler introduces Virtual Worlds (VWs) in language education, illustrating the VWs language learners are using today. He describes what researchers have found in their studies of language learners' use of VWs and the ongoing developments that may impact the future of language teaching and learning. There can be and often is an element of play when learners participate in VWs. In this sense, some overlap exists between VWs and language learning games. As Jonathon Reinhardt points out in Chapter 14, however, digital gaming can be undertaken in many different forms. Reinhardt lays the groundwork for understanding gaming in language education by reviewing the history and theory of games in CALL. He describes examples of games used by language learners and findings from research into language learners' use of games. He points to the need for collaboration among the stakeholders in the field—CALL researchers, second language instructors, and the language education gaming industry.

Implementation of all of the above configurations for learning may rely on mobile technologies including cell phones and tablets. Use of these commonplace mobile technologies for learning is referred to as "mobile pedagogy." Agnes Kukulska-Hulme, Helen Lee, and Lucy Norris introduce the mobile learning "revolution" as a response to learners' natural attachment to their interactive mobile devices. The idea is that their social media devices can be used for learning if they know how to do so. The know-how required to repurpose mobile devices into learning devices requires new conceptualizations of what is to be learned and reconceived activities for learning. The authors explain that because learners may act with more self-determination beyond the classroom walls, where online interactions and mobile encounters typically take place, learning tasks need to address students' interests and needs. Never has needs analysis been as important as when learners are outside class, on their own devices, and left to their own discretion as to how to engage with learning materials and activities. The authors provide a number of ideas for out-of-class mobile language learning that offer the learner the opportunity to promote communication and outline some of the implications for mobile language learning.



Pedagogical configurations such as distance, hybrid, or mobile learning are shared with all subjects in education. In contrast, the following three chapters describe technology-enhanced pedagogical approaches and issues that focus specifically on language education. In Chapter 16, Marta González-Lloret describes how task-based language teaching (TBLT) is implemented through the use of technology. TBLT is informed by second language acquisition theory and research, which hypothesizes how the learning of both language form and function can occur. González-Lloret presents key principles of TBLT stemming from these hypotheses and defines the concept of technology-mediated tasks. In Chapter 17, Elena Cotos introduces corpus-based pedagogies used for teaching language for specific purposes (LSP). By drawing upon corpus linguistics methods, she describes how individualized CALL materials can be developed to allow students to engage in hands-on explorations of texts relevant to their needs. In Chapter 18, Paige Ware examines the new literacies that have evolved through CMC and the language learning contexts and practices where these new literacies develop. Ware situates new literacies conceptually and historically and describes new literacy research focusing on texts, learners, classrooms, and connected sites for learning. Research on new literacies has raised issues of differential access to technology and linguistic and cultural hegemony, which are particularly relevant to second language learners. All three of these chapters identify directions for future research to better understand pedagogical practices.

The chapters in this section present a wealth of material to form the basis for pedagogical innovation in language teaching and learning. In order to bring these ideas to life, however, teachers play the central role, and therefore teacher education has been a critical topic in any discussion of new pedagogical practices. In Chapter 19, Greg Kessler and Phil Hubbard argue that, as technology has become integrated into language teaching, its integration in language teacher education remains an ongoing challenge. They provide a historical overview of developments and technology content in teacher education programs as well as current and future challenges facing CALL teacher preparation. The latter point should be evident from the contents of this *Handbook*, which could by itself form the basis for an entire graduate program or more. The challenges for teacher education are therefore significant, requiring collaboration across the curriculum in higher education.

## Part III: Technology for L2 assessment

The third section of the *Handbook* contains three chapters introducing issues in the use of technology for second language assessment. In Chapter 20, Joan Jamieson and Matteo Musumeci's analysis of classroom assessments that accompany foreign language learning materials shows how technology has expanded the options for assessing students' learning in a manner that connects to their learning materials. Jamieson and Musumeci's evaluation suggests that the assessments they investigated had a sufficient match with the instructional materials, but that they could be improved by better addressing learning goals, and by providing more thorough explanatory feedback and detailed score reporting to learners. Improvements might be possible through better communication between researchers studying second language acquisition, teachers, materials developers and assessment specialists.

In Chapter 21, Jonathan E. Schmidgall and Donald E. Powers describe the important role that technology has played in all stages of high-stakes testing development and use. Schmidgall and Powers introduce high-stakes testing in language education. They describe the critical role of technology in developing, administering, and scoring high-stakes tests as well as in supporting security in the testing process. They also identify future research on the use of technology in high-stakes language testing. Their discussion is grounded in the idea that technology is of interest to the extent that it can be shown to work toward the validity of

test score interpretations and uses. Chapter 22, expands on the meaning of validity. Yoo Ree Chung describes multiple layers of considerations that the use of technology brings to the validity of language tests when it is used for delivery and scoring. Specifically, she outlines a framework for an argument-based approach for validation that provides a means for understanding the technology considerations in language assessment.

These three chapters only scratch the surface of the work being done with technology in language assessment. Much of the professional research and development in this area remains on the innovator's workbench, at the prototype stage, and in research projects because of the impact that tests have on learners. Unlike instruction, where teachers feel it is appropriate to innovate in the classroom, it is more difficult to try out a new test without extensive research prior to roll-out. Moreover, the need for teacher education in technology and assessment is even greater than it is in technology and pedagogy.

## Part IV: Research and development of technology for language learning

All of the previous chapters in the *Handbook* show how technology has been central to innovative practice in language teaching and learning. A renowned investigator of innovation, in social practice, Rogers, defined innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers 2003, 12). In language education, technology is regularly included in conceptualizations of innovation such as this one from the *Encyclopedia of Applied Linguistics*: "Examples of innovation in language education over the past few decades include new pedagogic approaches, such as TBLT; changes to teaching materials; technological developments, such as CALL; and alternative assessment methods, such as the use of portfolios" (Carless 2013, 2689). In Markee's study of the diffusion of innovation in language teaching, he paints a broader picture by including the people, their skills, and their values when he defines curricular innovation as "a managed process of development whose principal products are teaching (and/or testing) materials, methodological skills, and pedagogical values that are perceived as new by potential adopters" (Markee 1997).

In this section, the chapters address the practices that are instrumental in creating innovations with technology in language learning and disseminating them to classrooms and the profession. These are the basic practices of research and development, which have developed an identity of their own in the area of technology and language learning. The identity has evolved to fulfill the pragmatic goal of creating practices and knowledge that allow for the best use of technologies for language learning, as described in the previous chapters. Many areas of applied linguistics work toward improving language instruction, but the unique identity of language learning and technology arises from the significant, multifaceted contributions that technology can make in the learning process. The complex affordances of the technologies are a critical part of the context of language learning.

The chapters in the first three sections reveal some of the complex interactions of technology with multiple avenues for language learning. In Chapter 23, Robert Godwin-Jones takes a closer look at the development of the affordances that appear in CALL materials. He describes how authoring tools and templates allow language teachers to construct their own materials, and how larger teams working on research projects or for publishers create extensive packages of materials. In such development work, authors are faced with numerous design questions including everything from how big the font should be in the instruction lines to how much control the student should have over help options. Many such design questions are at the same time pedagogical questions for which the field has no clear

response. In this context, developers have borrowed from research and development in learning sciences to engage in design-based research. Julio C. Rodríguez starts Chapter 24 with a brief introduction to the evolution of design-based research, an activity in which researchers and practitioners attempt to create new knowledge about educational software design through progressive testing and revision. Many developers have used some form of design-based research in practice for years, but Rodríguez presents a clearer conception of what it is and how important it is for technology and language learning.

The current research literature on technology and language learning consists of a range of types of evaluations of technology uses in, for example, learning vocabulary, improving field-specific writing, or experimenting with telcollaboration with a combination of desktop and mobile devices. In some cases these evaluations are designed as comparisons between a technology intervention and a “no technology” control, but in the majority of cases such designs would be either not feasible, uninformative, or both. In Chapter 25, Carol Chapelle reviews alternative approaches taken by professionals to conduct evaluations of technology and language learning. She exemplifies five types of arguments that are found in the published research on technology and language learning and describes how each one has been supported using a variety of research methods. In the following chapter, Dorothy M. Chun provides an overview of the research methods used in the technology and language learning literature. Basing the analysis on studies that are the most highly-cited or considered seminal or influential, she describes various qualitative, quantitative, and mixed-methods approaches that appear frequently in technology and language learning research, which she clarifies as referring to “Computer-Assisted Languaculture Learning,” to denote the fact that second language learning also entails learning about the cultures and developing intercultural competence.

Each of the following three chapters addresses a line of inquiry intended to improve the quality and utility of research on technology and language learning. In Chapter 27, Hsien-Chin Liou and Hui-Fen Lin examine how the methodology of meta-analysis can advance the profession’s understanding of the effects of technology-based pedagogies for second language learning. Considering the multiple meta-analyses that have been conducted in this area, they look at the rigor with which the meta-analyses are reported. The criteria they provide for rigor as well as their analysis of existing studies should help to prompt progress in future meta-analyses. Bryan Smith takes a different approach to improving research on technology and language learning in Chapter 29. He shows that many of the research questions posed about technology and second language learning can best be conceptualized by drawing upon theory and research on instructed second language acquisition. Moreover, research conceived in this way can benefit from and contribute to this line of research in the field. In Chapter 28, Thierry Chanier and Marie-Noëlle Lamy add methodological considerations unique to the study of multimodal environments. Their definition of multimodal environments captures much of the research and practice described in this volume. The discussion, which is grounded in their experience gathering and analyzing multimodal data in the Open Educational Resources movement, is widely relevant.

The final chapter identifies themes from the chapters included in the *Handbook* and looks to the future of technology and second language learning and teaching. From the first section of chapters, it is evident from the integral role that technology plays in teaching aspects of language knowledge and skills that the conception of those knowledge and skills needs to be updated to include the technology-mediated contexts in which language learners communicate and learn. The second and third sections introducing pedagogical innovations that have been developed as a result of the affordances provided by technology indicates the need for a dynamic professional agenda of innovation in teaching and assessment, teacher education, and research. The final section reveals some of the key concepts and practices that should help to move such an agenda forward. The chapters show research and development going



hand-in-hand as well as how the identity of this area of applied linguistics has developed by integrating ideas and practices from other areas of applied linguistics, predominately second language acquisition, as well as other fields. The chapters in this *Handbook* suggest the need to strengthen the research base for language learning and technology in part by engaging more fully with each of the areas that has contributed to the significant developments in technology and language learning. We hope that this *Handbook* will contribute to this engagement with other areas by presenting a clear statement about the nature and scope of technology and language learning.

## REFERENCES

---

- Carless, David. 2013. "Innovation in Language Teaching and Learning." In *Encyclopedia of Applied Linguistics*, edited by Carol A. Chapelle, 2689–2692. Oxford: Wiley-Blackwell.
- Chapelle, Carol A., ed., 2013. *Encyclopedia of Applied Linguistics*. Oxford: Wiley-Blackwell.
- Farr, Fiona, and Liam Murray, eds., 2016. *The Routledge Handbook of Technology and Language Learning*. London: Routledge.
- Markee, Numa. 1997. *Managing Curricular Innovation*. Cambridge: Cambridge University Press.
- Rogers, Everett. 2003. *Diffusion of Innovations*, 5th ed. New York: Free Press.