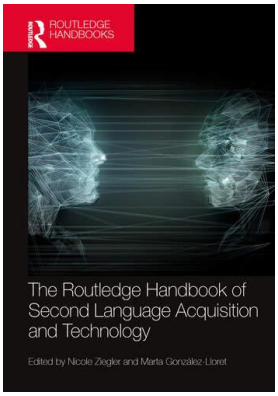

The Routledge Handbook of Second Language Acquisition and Technology

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Bridging the Gap Between Theory and Practice

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BRIDGING THE GAP BETWEEN THEORY AND PRACTICE

Technology and Teacher Education

Phil Hubbard

Introduction

Digital technology is such a part of the daily lives of language teachers and learners in many parts of the world that there is no longer a question of *whether* it should be incorporated in language education but rather *how*. Significant elements of it have become "normalized"—part of our regular existence rather than something exotic (Bax, 2003). Teachers and learners are already using digital devices and applications daily, sometimes extensively, in both their native and additional languages (Sauro & Zourou, 2019). Teacher educators thus have a crucial role in guiding teachers in making that transition from personal and social uses of technology to educational ones as part of not only pre-service education but also lifetime professional development. In doing so, they need to ground technology-mediated practices in relevant theory and research.

It is widely recognized that technology is not "just a tool" in education (Rose, 2012)—it is a dynamic part of the learning process. It can play a significant mediating role between learners and teachers; learners and other learners; learners and materials, such as tutorial applications and digital media; and learners and other interlocutors outside the formal class context. As noted in Blin (2016), for example, that role can be instantiated in theoretical frameworks such as Activity Theory and other frameworks that consider the broader ecology of the language learning environment. This chapter aims at helping stakeholders in language teacher education understand how teachers can develop the knowledge, skills, and confidence necessary to integrate technology effectively into their specific teaching contexts.

Two terminological points should be clarified before proceeding. First, *technology* is used throughout to apply to *digital* devices like desktop and laptop computers, electronic tablets (e.g., iPads), smartphones, electronic whiteboards, and other electronic tools currently available and still to be invented. The nature of their mediating properties is qualitatively different from televisions, radios, telephones, and even books and pens, all of which can be seen as technologies in a broader sense (Bax, 2003). Second, for ease of exposition, this chapter will on occasion employ the term *CALL* (computer-assisted language learning) in reference to the use of digital technology in the language teaching and learning process.

Although a number of other terms have been proposed, CALL has arguably gained the most traction and is incorporated into the names of a number of professional journals (e.g., *ReCALL, CALL Electronic Journal*, *Computer Assisted Language Learning*, and *International Journal of Computer Assisted Language Learning and Teaching*), organizations (e.g., EUROCALL, TESOL CALL Interest Section, Pacific CALL, and ChinaCALL), along with their associated conferences.

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Besides these, some CALL groups are specifically tied to teacher education as a more formal community of practice: see, for example, the EUROCALL teacher education special interest group (SIG).[1]

In line with the structure of other contributions to this volume, this chapter first explores the history and evolution of technology in the context of language teacher training. It then reviews a range of relevant critical issues and topics, followed by examples of recent contributions and insights from research, along with a discussion of common research methods. It concludes with sections on recommendations for practice and future directions for technology and teacher education.

Historical Perspectives

Although the use of computers for language teaching and learning goes back to the mainframes of the 1960s and 1970s (see, e.g., Scanlan, 1971), the advent of the personal computer in the late 1970s made owning such a device possible for individual teachers and language programs. By the early 1980s, a number of language teachers were experimenting with incorporating computers in their classroom teaching. In many cases, these teachers were also the programmers, and they found kindred spirits at conferences they attended. Three of the leading organizations that appeared during this time were the Microcomputer Users in ESL Institutions (MUESLI) SIG of IATEFL (now the Learning Technologies SIG), the CALL interest section of TESOL, and the Computer-Assisted Language Instruction Consortium (CALICO). Over the next few years technology-using teachers who were also teacher educators increasingly offered formal courses and eventually certificates and degrees at their institutions. The University of Kent had one of the early degree programs, the MA in Applied Language Studies: Computing, from 1993 to 2002 (Partridge, 2006). In 2004, CALICO formed its Teacher Education SIG.[2] EUROCALL followed in 2009.[3]

However, well before the formalization of specialized teacher education groups, journal articles on the topic were already appearing. By 2002, there was enough interest in technology and teacher education to warrant a special issue of *Language Learning & Technology*. In their introduction to this issue, Zhao and Tella (2002, p. 1) noted, "The ability to teach with technology is quite different from the ability to use it, because technology must be integrated with a sound pedagogical framework." They continued, "Thus, the first issue we must consider in preparing teachers to use technology as a pedagogical tool and as a new teaching and learning environment is how it interacts with current pedagogical approaches." This was a reasonable position for the time, but the past two decades have shown us just how quickly available technologies for language teaching can change and in the process offer new options to language pedagogy.

After the 2002 special issue touting the integration of "current pedagogical approaches" as the target, Facebook was launched in 2004, YouTube in 2005, WhatsApp in 2009, and Google Docs in 2009. The prevalence of these and other platforms has led to the widespread ability to engage respectively with social media; video sharing for both consumption and production; text, audio, and video messaging; and collaborative writing and editing. Some early CALL teacher education courses recognized this shift toward new technologies in daily life and worked toward insuring that their teacher candidates were proficient in incorporating them into language classes. Descriptions of a number of these innovative courses appeared in Hubbard and Levy's (2006) *Teacher Education in CALL*, the first edited volume fully devoted to the topic. Debski (2006), for example, reported on how his teacher candidates acquired technological and pedagogical skills in tandem through project-based learning, following the concept of "constructionism" (Harel & Papert, 1991) to create a website to orient new international students to local culture. Eskenazi and Brown (2006) had their teacher participants design software for pronunciation practice, integrating speech recognition technology and learning theory. As the central theme of her CALL course, Chao (2006) used Webquests, where teachers created web-based tasks that supported development of both learners'

web-searching proficiency and their language skills. By the end of the course, the teachers had not only developed new technology skills but had also engaged in a project to link language pedagogy and technology in the novel domain of finding information on the web, creating something practical they could take away to their own classrooms. The following year CALICO published *Preparing and Developing Technology Proficient L2 Teachers* (Kassen et al., 2007). Of particular note were three chapters on the use of electronic portfolios in teacher training (Cummins, 2007; Tochon & Black, 2007; van Olphen, 2007), providing teachers with firsthand experience using electronic portfolio-based pedagogy that they could then transfer to their own language classes.

Since then, a variety of articles, journal special issues, and books have expanded our understanding of the challenges involved in training language teachers to be proficient users of technology in their classes. The following sections explore these challenges and describe some of the ways in which theory, research and practice have combined to address them. One such challenge that is still developing at the time of this writing involves the forced dramatic shift to online language teaching during the opening months of 2020. This situation may well lead language teacher education programs to look into the degree to which they had prepared their recent students to make that shift and what curricular changes they may need to make for current and future students.

Critical Issues and Topics

This section highlights several of the more prominent issues and topics that represent important considerations for teacher educators in bridging the gap between theory and practice for using technology in language teaching. These involve an understanding of the status of theory in underpinning CALL research and practice, the separation vs. integration of technology training, teacher attitudes and related challenges, the teaching and learning context, and technology standards.

Theory in CALL

One area that stands at the forefront of understanding how to prepare language teachers for technology-mediated teaching and learning is the interdisciplinary nature of the field of CALL that underlies much of the relevant work (Chapelle, 2001). This section briefly reviews some of the concepts and considerations surrounding theory in a domain where the field of second language acquisition intersects areas like multimedia and multimodality, human-computer interaction, virtual presence, and many others. Following Hubbard and Levy (2016), *theory* in this context is taken to refer broadly to the set of perspectives, theoretical models, frameworks, and specific theories that:

1) offer generalizations 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 (p. 25).

Within applied linguistics, considered by some (e.g., Egbert & Hanson-Smith, 1999) to be the parent discipline of CALL, there has been a shift in recent years away from singular theoretical perspectives like that of interactionists (e.g., Chapelle, 2001) toward a broader and more inclusive view of what language is (and by extension, other semiotic systems) and how language learning and language use are connected. This shift is true of both classroom learning and informal, out-of-class learning in what has been referred to as the "digital wilds" (see Sauro and Zourou (2019) for an overview), and it encompasses challenges to classical views of a native speaker target for learning and even the breaking down of borders between the so-called target language and the learner's L1 and other languages. A compelling statement of this position reimagining the field as

"transdisciplinary" has been put forward by the Douglas Fir Group (2016), a collaborative venture of 15 leading applied linguists.

Providing teachers with any kind of theoretical framing for using technology has always been something of a challenge. As Hubbard & Levy (2016) note, "… there is no established CALL theory or even set of CALL theories that have been developed internally by scholars in the field to uniquely characterize it" (p. 25), and the potential theoretical frameworks go beyond the simple borrowing of SLA theories. There is a need to accommodate the role of technology and the context in which it is being used, whether in the classroom, online, or outside of class. An early influential view was that of Egbert and Hanson-Smith (1999), who declared that there was no need for a theory of CALL: "… 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). The potential problem with this position is that "the implications for the learning environment" turn out to involve a number of theoretical perspectives outside of SLA.

As an example of the plethora of theoretical influences in CALL research and practice, a review of 25 years of articles in the *CALICO Journal* (1983-2007) identified 113 distinct theoretical references from areas such as linguistics, psychology, education, and computer science, with only a minority relating directly to SLA (Hubbard, 2008b). In discussing the forms of theory implementation in CALL, Hubbard and Levy (2016) note that some CALL research is essentially atheoretical, and the remainder is underpinned by a variety of types of theory inputs: theory borrowing, theory adaptation, theory synthesis, theory instantiation, and theory ensembles. Theory borrowing as the name suggests simply entails taking a theoretical construct from SLA or some other domain directly into the CALL context without changing it. Theory adaptation starts with borrowing a theory, model or framework and then adjusting it to account for the impact of technology mediation (e.g., Smith 2003). Theory synthesis takes two or more theoretical frameworks and integrates them into a single entity, as Plass and Jones (2005) did with their merging of interactionist SLA theory and the cognitive theory of multimedia into a model for multimedia-based language learning. Theory instantiation occurs when a more general learning theory with a space for the role of technology mediation is incorporated into CALL research, as Blin (2016) demonstrates for Activity Theory.

Finally, theory ensembles are collections of theoretical entities operating together to provide a richer set of perspectives on a phenomenon than a single theory would allow, as reflected in Cornillie et al. (2012), whose work combines "the differing perspectives and theoretical traditions of language learning and gaming in a coherent way" (Hubbard & Levy, 2016, p. 27).

Teacher Attitudes and Related Challenges

A number of factors can influence teacher acceptance of technology and willingness to advance in their use of it. Chief among these is inertia (Hubbard, 2008a): teachers who believe they have achieved success teaching languages with no or limited use of technology, or the technology from a decade or more ago, may find no compelling reason to change their methodology to integrate more technology mediation into it. Son (2018) notes several other challenges to achieving success with CALL, some of which can be overcome with appropriate training: limited time, insufficient knowledge, insufficient skills, insufficient facilities, curricular restrictions, social pressure, academic culture, and of particular note, the attitudes and skills of teacher educators.

An opposing tendency for some teachers and teacher educators is to be pulled into the "hype cycle" (originally from Gartner: see Linden & Fenn, 2003), where whatever is the latest trend is seen uncritically as the basis for a language education revolution. For example, when iPads first became widely available, it was not uncommon to see this trend in action, as in the following prediction from 2010 of how the iPad would revolutionize education:

> It is clear from the information included in the paper, that our concepts of education in general, including language teaching and learning will be changed forever. Students of the near future may never experience the classroom of today. They may never have to buy or carry textbooks to class. They may never study in classrooms that are not completely wireless and interactive. They will be issued with iPads as standard upon entering university and this iPad will be everything they need for study throughout their university life.
>
> *(Ireland & Woollerton, 2010, p. 47)*

This enthusiastic overreaction to the iPad as a novel technology is nothing new for CALL: Murray and Barnes (1998) reported a similar response to the then emerging technology of computer-based multimedia, referring to the naïve acceptance of such new technologies for language learning as "the wow factor." The point is that both uncritical acceptance and uncritical rejection need to be avoided. One step toward achieving this goal is by guiding teachers through the history of the field to see the patterns of acceptance and integration and at the same time providing vivid hands-on technology experiences that will lead them to become both open to and appropriately skeptical of emerging technologies for language teaching and learning.

Separate or Integrated CALL Teacher Education?

The past few decades have witnessed the development and spread of independent CALL courses and even sequences of courses as a recommended approach to technology training for language teachers (Desjardins & Peters, 2007). So where is the dividing line in teacher education courses between normalized use of technology in language teaching (based on how teachers already employ technology in their non-teaching lives) and the explicit teaching of technological skills and knowledge integrated with language pedagogy?

A potential path for resolving this issue is to recognize the different knowledge and skill bases involved in using technology for incidental personal and social purposes and using it for supporting specific language teaching and learning objectives. It starts with a recognition of the teacher's level of "digital literacies" both in general and as they relate to pedagogy (Dudeney et al., 2014; Pegrum, 2019). A full discussion of these literacies is beyond the scope of this chapter, but the sections below on standards and recommendations for practice provide further information on the knowledge and skills underlying them.

Understanding Contexts: Classroom, Mobile, and Online

A common context for technology use is the language classroom and related institutional facilities, for example, the one-computer classroom where the teacher presents materials and media, the computer language lab with students working individually or in groups, and the students' use of their own devices in class for language activities.

Mobile assisted language learning (MALL) offers another set of contexts that can vary significantly from classroom learning. As Pegrum (2019) observes, there are three distinct types of mobile learning: the device may be mobile, the learner may be mobile, or the task or learning experience may be mobile. Only the first context, where the learner may bring the mobile device into the class, overlaps directly with classroom learning. For an example of a CALL course with a significant MALL component, see Chao (2015).

A third and growing context is online, especially since in the first half of 2020, many classroom teachers were forced without much or any preparation into the online environment. A recognition of the differences between online and classroom teaching has emerged in the past two decades. Linking SLA theory and online practice, Doughty and Long (2003) proposed a theoretical foundation for online language teaching based on a set of psycholinguistic principles closely connected

to the interactionist perspective. For teacher education, Hampel & Stickler (2005) leveraged their experiences at the UK Open University to create a training framework in the form of a seven-level skills pyramid with technical competencies on the lower levels building up through competencies in online socialization and pedagogy to creativity and choice, with the teacher's own style at the top. Expanding on their work, Compton (2009) produced a more comprehensive framework for the skills, roles, and responsibilities of online language teachers. Her conceptualization for online teaching skills as a target for teacher education includes categories of technology, pedagogy, and evaluation across levels of novice, proficient, and expert teachers. Though there is some overlap, these three levels correspond roughly to usage and knowledge bases (novice), ability to choose and facilitate (proficient), and creativity, along with programming and development skills (expert). Teacher educators are encouraged to look into Compton's framework and others for guidance in developing course content to insure a solid grounding in the online context for teacher candidates.

Standards

Formal technology standards offer a way to provide clear, consistent, and comprehensive targets for teacher education that can help bridge the gap between theory and practice. Murphy-Judy and Youngs (2006) first addressed this issue for CALL in a paper that compared and contrasted standards in three contexts: at a U.S. public university, at the national level in Colombia, and across the transnational Common European Framework. Two years later TESOL released the Technology Standards Framework for Teachers and Learners (Healey et al., 2008), followed by a more comprehensive volume (Healey et al., 2011) that included a chapter with guidance for teacher educators. The 14 TESOL Standards for Teachers are organized into four overarching goals covering 1) foundational knowledge and skills in technology for professional purposes; 2) integration of technology with pedagogical knowledge and skills; 3) applications of technology in record-keeping, feedback, and assessment; and 4) use of technology to improve communication, collaboration, and efficiency. The Standards thus represent an important guide for those involved in CALL teacher education. A detailed example of a CALL course integrating the Standards is described in Tschichold (2016).

Current Contributions and Research

In 2015, *Language Learning & Technology* published a second special issue on technology and language teacher education, with seven articles covering CALL teacher education across a variety of contexts, formats, topics, and research methods. Several focused on innovative and emerging areas: Shin (2015) described providing teachers with instruction on ethical and legal issues, Liu and Kleinsasser (2015) explored in-service teacher technology knowledge and competencies using the TPACK (technological and pedagogical content knowledge) model found in other educational domains, O'Dowd (2015) presented a competency-based model and supporting case studies for telecollaborative teacher education, and Kozlova and Priven (2015) reported on their success with teacher candidates developing and implementing language tasks using a 3D world.

Torsani (2016) provided the field with what was likely the first monograph on the topic of CALL language teacher education, focusing on the target of training teachers for effective technology integration and covering theoretical foundations, frameworks and standards, approaches and processes, and training procedures. A novel contribution was her presentation of a theoretical framework and recommendations for CALL course and curriculum design. Anchored in a social-constructivist perspective emphasizing flexible technical and pedagogical skills, rather than ones specific to individual tools and technologies, her suggested syllabus for a CALL course included reviewing the history of CALL, an introduction to theoretical and evaluative frameworks, technology and language skills, task design, computer-mediated communication, online tools, and social networking. As noted above, Son (2018) reflects some of the most recent work in technology and teacher education.

His book includes not only a solid overview of the field but also offers teachers a useful framework for professional development that he calls ECCR for its four interacting components: exploration, communication, collaboration, and reflection. In exploration of existing technologies and resources, teachers act as learners and experience these directly. In electronic communications with learners, administrators, colleagues, and others, not only expand and maintain relationships, but they also become more proficient in a range of computer-mediated communication (CMC) tools and practices for collaboration. Finally, reflection on these experiences completes the cycle and prepares the teacher for the next round of exploration. See the section on recommendations for practice for more detail.

Beyond individual courses limited to interaction with the teacher educator and among classmates, telecollaborations (also called virtual exchanges) are an option for CALL teacher education and represent a clear example of teachers learning about technology through using technology themselves. In a virtual exchange among language teacher candidates at three institutions, Arnold et al. (2009) looked at the forms and development of online collaborative skills and patterns of participation. Based on their findings, they recommend that participants in these contexts be provided with preliminary training in communication strategies for effective collaboration and that students in groups be assigned specific roles to increase motivation and participation. In a long-term study of telecollaboration, Sadler and Dooly (2016) describe lessons they learned from 12 years of virtual exchanges in teacher education classes at one university in the US and another in Spain, during which time they increased the number of telecollaborative tasks and refined them. They note how "The evolution of this telecollaboration reflects both a notable change in the mindset of the teachers as well as a deeper sense of responsibility from the students for their own learning" (p. 401). Over the years, the telecollaboration element moved from an add-on to the core of the programs, with the student-teachers using technology to learn about the affordances of technology experientially. By the end of the programs, Sadler and Dooly's student-teachers were expected to be able to do the following:

- set up and organize meetings outside of class time …;
- undertake continuous self- and peer evaluation as a percentage of the final mark;
- explore a variety of tools that are not introduced in class;
- focus on critical thinking and dialogic interaction;
- reflect and discuss materials BEFORE class (flipped);
- take on the continuous role of evaluator; and
- collaborate with peers who are not teaching the same area and levels (pp. 411-412).

Main Research Methods

Technology and teacher education research uses many of the same methods that instructed SLA does, and these are covered in other chapters of the current book. Here, we review three general approaches: surveys, case studies, and reflective reporting.

Surveys

Surveys have been widely used for three purposes: to probe attitudes toward integrating technology and language teaching, to allow teacher reporting of current technology readiness, and to explore how teachers are already integrating technology into their teaching. Results of these surveys can be used as a needs analysis tool to inform educational policy, CALL course design, and professional development initiatives. However, surveys suffer from a number of issues: as self-reports they involve the same issues of reliability that all self-reports have (see Fischer (2007) for an empirically based critique of survey responses vs actual use among students);

they are often done for a relatively local setting; and they typically are voluntary and may thus not be representative. Consequently, any claimed findings must be carefully scrutinized before using them. Additionally, most CALL-oriented surveys are timebound due to the rapid shifts in technology adoption and use. As one example of how quickly technology use surveys can be out-of-date, the Pew Research Center (2019) reports that from the beginning of 2012 to the end of 2016, smartphone ownership in the US doubled (from 39% to 77% of adults) (www.pewresearch.org/internet/fact-sheet/mobile/).

Yet despite their limitations, surveys can be valuable if they are rich, timely, well-motivated, and tap into areas of need. Kessler (2007), for example, reported on a web-based survey of over 100 language teachers who had completed their master's programs. Besides providing a broad overview of teacher attitudes toward CALL and experiences in both formal and informal CALL learning, he concluded that there is a great need for more formal training. His recommendations remain relevant more than a decade later:

> Formal CALL preparation should be at least as influential toward a teacher's attitude toward technology informal training if it is to continue. To achieve this, programs of study may need to face revision to include a CALL component in order to adequately address the changing needs of language teaching professionals. Perhaps a CALL component should be introduced into all language teaching masters programs. Perhaps CALL could be integrated into a variety of pedagogical classes, thus allowing it to be introduced in a contextualized and relevant manner … It may also be beneficial for professional organizations and universities to offer more CALL preparation to those teachers who have already completed their preparation, but did not have this type of instruction available in their degree program.
>
> *(p. 184)*

Finally, surveys can be an important component of a mixed-methods research design when combined with data from other sources like participant journals, discussion boards, interviews, or projects, providing a richer picture of the teachers' CALL learning experience.

Case Studies

Case studies of either a specific class or one or more individual students can be particularly illuminating because they can show development over time. Slaouti and Motteram (2006) tracked the evolution and reconstruction of language teacher practice in information and communication technologies throughout a training course involving 20 in-service teachers. The research analyzed extended narratives provided by the teachers after the course in which they described their motivations and expectations, the ways the class impacted their professional development, and its influence in their subsequent teaching. The authors documented how over time a number of the teachers shifted their attitudes towards technology and came to take ownership of the knowledge and skills they were exposed to. On a more individual level, Wong and Benson (2006) discussed the cases of two similarly aged teachers at mid-points in their careers who took a CALL professional development course and were then followed as they returned to their teaching with the new knowledge and skills. The two had differed in their comfort with and use of technology prior to taking the course, with one having greater experience and confidence than the other. Despite their being exposed to the same content and tasks during the course, the authors showed that the one who had more technology experience implemented newly acquired elements from the course experience into her subsequent teaching. In contrast, the one who had acknowledged limited use of technology prior to taking the course returned largely to her previous teaching style. Although we cannot generalize from a single study, documenting such contrasting cases can help teacher educators understand why

they need to consider individual needs more explicitly rather than using a one-size-fits-all methodology in their CALL-oriented courses.

Reflective Teaching

Reflection is both a research methodology and a principle of good teaching and learning practice. In the case of research, some studies have relied on data from portfolios, teacher journals, discussion boards to capture the reflective nature of the teacher-learning process. Reflective teaching has been integrated for some time in CALL teacher education (e.g., Lord & Lomicka, 2007)) and is a specific component of Son's (2018) ECCR framework. In Hubbard and Ioannou-Georgiou's (2017) edited volume, the contributors report on how they integrate reflective practice into teaching with technology. Several of these are specific to teacher education rather than teaching language learners. Sabieh (2017) shows how project-based learning with movie creation can be used to support teacher trainees in learning theory and technology together and reflects on her experience as the teacher educator implementing this approach. Stanley (2017) discusses a professional development project where teachers reflected on the experience of integrating digital games into their language classrooms. Thomas and Schneider (2017) similarly offer reflections from a two-year project involving a teacher-training course in which participants engaged in experimentally using and producing "machinima" in their language classes—recorded videos made in an immersive environment. Reflective teaching with technology can also be manifested through electronic portfolios of the type discussed by Tochon and Black (2007).

Recommendations for Practice

Given the focus of the present chapter, the question underlying recommendations for practice is basically this: How do we guide teachers to become knowledgeable and skillful in implementing technology into their teaching settings, whether in the physical classroom or online? In answering this question, we can consider three domains of practice. One is the practice of teacher educators in dedicated CALL-focused courses providing teachers with the basic skills and knowledge they need for integrating technology in the classroom. Another is the practice of teacher educators in integrating technology proficiency (or TPACK, see Tai, 2015) into courses focused on other types of content, for example, methods and materials, assessment, reading, etc., where technology is a significant part of the course but not the main part. Finally, there is the domain of practice for teacher educators that involves preparing and supporting teachers for learning on their own in self-directed professional development. This domain can be addressed within formal teacher training courses, through workshops and mentoring at conferences, in webinars, and through publications ranging from newsletter articles to books. The practice of teacher education in CALL is thus heavily dependent on the institutional context in which the teacher educators and candidates or practicing teachers find themselves.

With respect to the first domain of practice, there are several options for integrating technology into teacher training courses. Hegelheimer (2006) describes a model where new graduate students take a technology-centered course initially to provide a common background for their MA TESOL program. Subsequent courses on various topics can then incorporate technology as needed knowing that all the students have a common background and adequate level of technical proficiency. A source for more recent examples of dedicated CALL courses is Son and Windeatt (2017), an edited volume on exemplary CALL courses that can provide useful templates for teacher educators wishing to develop or refine their own.

With respect to the second domain, Arnold (2013) noted that some language teaching methodology textbooks at the time provided a foundation for using CALL independently of a dedicated CALL course. However, she also concluded that this initial foundation needs to be supplemented, possibly throughout the curriculum, with other material covering: "(1) potential drawbacks of

CALL; (2) CALL-specific pedagogy; (3) reflection tasks, especially for first generation CALL teachers; (4) references to relevant CALL studies; and (5) distance and hybrid L2 learning" (p. 242). Language teacher education programs without a robust CALL component would profit from considering her advice.

For the third domain, the goal is to support teachers' professional development through both formal in-service training and even more importantly, self-directed learning (Hubbard, 2018). Arnold (2013) notes that the latter entails teachers learning to act more autonomously: "… taking an active role by identifying sources for professional development, formulating concrete goals, and reflecting on their progress (TESOL Standard 1.3)" (p. 242). A critical aspect of being a technology-proficient language teacher is the recognition that professional development in this area never stops.

Two other key considerations for practice are *how* to train teachers and *what* the content of the training should be. In terms of how student teachers learn, Hubbard (2008a) describes seven methodological options for teacher education and professional development beyond traditional lecture and demonstration, most of which are connected to theoretical frameworks or models: project-based, situated learning, reflective learning, portfolio-based, mentor-based, communities of practice, and self-directed learning. While some elements of CALL may still be learned efficiently through lecture and demonstration, combining a number of the preceding options as well will be beneficial. In terms of what can be included in a CALL course beyond the training in digital tools and technology-mediated learning activities and tasks, Kessler and Hubbard (2017) highlight four emerging areas: assessment, student feedback, observation and monitoring, and social networking. Son (2018) complements his ECCR framework mentioned previously with a teacher education model based on roles. The model states that technology-using teachers should become proficient in the following basic roles:

- *observers* of students during CALL activities,
- *designers* of CALL applications and activities,
- *implementers* – "when they try to understand the notions of CALL theory and practice and use CALL in and out of the classroom" (p. 34),
- *evaluators* of student use and outcomes.

He also acknowledged two more expanded/expert roles:

- *managers* to help other teachers with CALL use and assist students in self-access situations, and
- *researchers* adding to the knowledge base of the CALL field.

If teacher educators at least introduce future teachers to such a range of roles, this may help to enhance their sense of agency in their future practice.

The Teacher Education SIG of EUROCALL released an edited volume on professional development and CALL available online (Giannikis et al., 2019). The book covers a rich range of topics of value to teacher educators: the use of technology in primary, secondary, and tertiary education; e-learning facilitation; the integration of personal learning environments; the use of MALL; the applications of virtual reality; materials design; the use of information and communications technology in task-based language learning; and the integration of social media networks in language education.

Future Directions

In discussing CALL and the future of language teacher education, Hubbard (2008a) notes that many teachers currently being trained are in their twenties and are likely to have careers of 40 years or more. How can teacher educators prepare them for that future? Kessler (2018) observes the need to

establish the connection between language pedagogy and current and emerging participatory and collaborative tools, which he predicts will continue to be central well into the future. Although it is important to be current, we cannot provide an adequate foundation for a teacher's career by focusing *only* on the past and present technological and theoretical landscape. Even a cursory review of the technology shifts that have occurred in the last decade or two carry the message that today is not a reliable model for what tomorrow will be like. But beyond that, instead of solely focusing on having teachers become proficient with a number of established applications and how to leverage them, we need to be training teachers how to deal independently with the inevitable cascade of future technologies they will be encountering (Kessler & Hubbard, 2017). This means building a basic understanding of the nature of digitally mediated communication and learning, as well as incorporating guided experiences in what to do when a novel application is encountered.

Today, a number of emerging technologies broadly referred to as AI (artificial intelligence) offer the potential to improve language learning (or in the case of machine translation perhaps even obviate the need for it). Others such as virtual worlds, virtual reality and augmented reality appear promising as well. Teacher educators can raise their students' awareness of these technologies and encourage some exploration while at the same time emphasizing that if history has told us anything, it is that they will emerge far more slowly and with less impressive results than many presently imagine. Critical evaluation of these technologies is crucial, but it requires a foundation of relevant knowledge and experience.

Arnold (2013, p. 242) echoes this sentiment, concluding that teacher educators should not be "focusing exclusively on knowledge but also fostering transferable skills that teachers can use in the future as new tools become available." Thus, it is critical to:

1) train teachers with broad foundational materials and principles that sustainably connect theory, research, and practice rather than just working naively with the present crop of digital tools or "leading edge" technology that may turn out to have never led at all and
2) guide them to be appropriately skeptical of innovative technologies while
3) still incorporating tasks in the course or curriculum that allow them to explore and support developing their competence and confidence to do so.

Conclusion

This chapter has looked at the need for teacher educators to bridge the gap between theory and practice in technology-mediated language learning and teaching. It has described issues and challenges, along with models and practices that can guide teacher educators to prepare new teachers as well as support the professional development of those already in-service. A recurring theme is the need to train for an unpredictable future by providing a strong foundation in integrating technological and pedagogical skills and knowledge along with the tools and mindset to explore new technologies and new teaching contexts as they appear.

The experiences of the 2020 COVID-19 pandemic have shown us all just how quickly the teaching and learning environment can change. Rank-and-file teachers (and their students) at all levels were suddenly thrown into an online teaching environment. Teacher training programs had to retool overnight as well, if only to move online themselves. Even those who had grown up with technology were not prepared. In a large scale study in Germany of early-career teachers during the pandemic-triggered move to online teaching, König et al. (2020) conclude that even for young teachers, digital literacy cannot be taken for granted: "Contrary to our expectations, early career teachers' status as belonging to the generation of 'digital natives'… does not guarantee that they have developed sophisticated digital skills in general" (p.11). They state that moving forward, teachers' competence in technology-mediated pedagogy needs to be significantly enhanced in both their initial training and in professional development. Gacs et al. (2020) described the case

of language teaching at Michigan State University in the US, where following the university decision to move everything online "we only had 2 hours to prepare" (p. 381). However, because of their language instructors' training and experiences teaching a robust set of online and blended learning language courses in prior years, they were relatively successful in their sudden transition. Their article shares that experience, providing guidance on preparing, planning, implementing, and evaluating online language education. Importantly, it addresses what to do when faced with a crisis teaching situation such as that brought about by the pandemic.

At the time of this writing, teachers and teacher educators are still working with their students largely in the online realm, and we can anticipate that a flock of studies over the next few years will shed additional light on how to more successfully teach languages across a range of contexts beyond the traditional classroom. These will be important for teacher educators to reflect on. As noted in the introduction, technology can certainly no longer be considered an add-on, but is rather an integral part of current and future language teaching. It is thus incumbent on teacher educators, language programs, and teachers themselves to establish foundational skills and knowledge and to emphasize and support lifelong professional development, so that technology-mediated language learning and teaching is relevant, engaging, efficient, and effective.

Notes

1 See https://www.eurocall-languages.org/sigs/call-teacher-education-sig-homepage.
2 See Internet Archive snapshot from December 5, 2004—https://web.archive.org/web/20041208232041/http://calico.org/sigs.html#ted.
3 See the Internet Archive snapshot from December 20, 2009—https://web.archive.org/web/20091113085745/http://eurocallteachereducation.ning.com/.

Further Readings

Healey, D., Hanson-Smith, E., Hubbard, P., Ioannou-Georgiou, S., Kessler, G., & Ware, P. (2011). *TESOL technology standards: Description, implementation, integration.* TESOL.
It includes a full range of vignettes describing specific uses in context for each standard for high, mid, and low technology resource settings. Other highlights include chapters targeted at teacher educators and language program administrators, as well as one providing a concordance with other well-known standards. A collection of "can-do" statements based on the original performance indicators allows individual teachers to self-assess their compliance with the Standards.

Giannikis, C, Constantinou, E. & Papadima-Sophocleous, S. (Eds.) (2019). *Professional development in CALL: A selection of papers*. Research-publishing.net. https://research-publishing.net/publication/978-2-490057-28-3.pdf.
This freely available edited volume is from the members of the Teacher Education Special Interest Group of EUROCALL. It includes examples of professional development in CALL in primary, secondary, and tertiary settings. Chapters cover areas such as social media for language teaching, mobile assisted language learning, virtual reality, personal learning environments, and materials design.

Kessler, G. (2018). Technology and the future of language teaching. *Foreign Language Annals*, *51*(1), 205–218.
In this article, Kessler emphasizes the key role that technology should play in language teacher education, especially given the established participatory culture of social media. He argues that certain technologies and technology applications will likely play an increasingly important role: collaboration technologies; mashups created by learners from multiple text, audio, and video sources; automated writing evaluation and speech recognition; augmented and virtual reality; and artificial intelligence. A key point is that teachers should be trained to work within an environment of constant change since technology changes so rapidly.

Son, J. B., & Windeatt, S. (Eds.). (2017). *Language teacher education and technology: Approaches and practices*. Bloomsbury Publishing.
This edited volume contains chapters describing nine CALL teacher education courses around the world. These courses offer a range of approaches and learning goals that can be adapted for use by teacher educators, as

well as examples of freely available resources. Opening and closing chapters provide an overview of CALL teacher education and underscore the need for formal education and professional development. In an appendix, a useful table compares the nine courses across domains of mode, objectives, contents, texts and readings, and form of assessment.

Torsani, S. (2016). *CALL teacher education: Language teachers and technology integration*. Springer.
Torsani's monograph discusses a range of topics related to the integration of technology in language education, providing a solid foundation for teacher educators to work from. It begins with chapters on the history of CALL and the relationship of CALL and linguistics, moving from theory to practice. It has a rich chapter on approaches and processes and is noteworthy in offering a theoretical framework for the CALL curriculum and then exemplifying its application. The framework and other models she proposes are applicable to a range of settings, providing guidance to teacher educators for both dedicated CALL classes and integrating technology into mainstream subjects in language teaching.

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