Historical perspectives on CALL

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Summary

Historically computer-assisted language learning (CALL) has been shaped not only by trends in language pedagogy and second language acquisition (SLA) theories, but also by the state of computer technology. While the evolution of computer technology can be described in a relatively linear and organized fashion, SLA and language pedagogy have developed as a disorganized, multipronged and often contradictory collection of notions and practices. As a result, viewing the growth of CALL through a theoretical and pedagogical lens reveals a complex and fascinating history that spans decades of technological advancement and reflects the multifaceted field of language pedagogy and SLA research from which it arose. This chapter traces the evolution of CALL from the last half of the twentieth century – when cognitive and psycholinguistic theories of SLA predominated – into the twenty-first century, when theories and pedagogies that emphasize the social dimensions of language learning have gained traction. Computer technology grew from primitive mainframes to powerful networked multimedia microcomputers with access to the internet and World Wide Web. Within this context, CALL has progressed from drill and practice exercises targeting grammar and vocabulary towards a wide array of sophisticated interactive programs for reading, writing, listening, pronunciation and culture.

Introduction

The history of CALL has been well documented. Sanders (1995) and Levy (1997) cover the period from its beginnings in the 1960s until the mid-1990s, and Delcloque (2000) provides a comprehensive account of CALL until the beginning of the new millennium. Davies (1997) covers the period 1976–96, reflecting on his personal experiences and reminding us that there are many lessons that we can learn from the past. Jung (2005)
takes a bibliometric approach, focusing on the contents and nature of publications on CALL and how they have reflected its constantly changing manifestations. Butler-Pascoe (2011) takes us back to the early stages of the use of courseware in second language teaching in the 1960s, through the emergence of multimedia in the 1990s and up to new developments in the twenty-first century encompassing the use of Web 2.0 tools that provide new opportunities for computer-mediated communication (CMC). In light of these previous studies, the aim of this chapter is to provide a historical overview of the ways in which language learning technologies have been interpreted and to identify the antecedent conceptualizations, and relationships with other disciplines that have contributed to current usages.

Historically computer-assisted language learning has been shaped not only by trends in language pedagogy and SLA theories, but also by the state of computer technology. While the evolution of computer technology can be described in a relatively linear and organized fashion, SLA and language pedagogy have developed as a disorganized, multipronged and often contradictory collection of notions and practices. As a result, viewing the growth of CALL through a theoretical and pedagogical lens reveals a complex and fascinating history that spans decades of technological advancement and reflects the multifaceted field of language pedagogy and SLA research from which it arose. This chapter traces the evolution of CALL from the last half of the twentieth century, when cognitive and psycholinguistic theories predominated, through the first decade of the twenty-first century, during which rising interest in theories and pedagogy that emphasize the social dimensions of language learning has coincided with the explosion in social networking and mobile technologies.

Origin of the term CALL

It is not entirely clear when the term CALL first appeared. Computer-assisted instruction (CAI) and computer-assisted learning (CAL) predate CALL as generic terms, and CALI (computer-assisted language instruction) was incorporated into the name of the professional association CALICO (Computer-Assisted Language Instructed Consortium), which was founded in the United States in 1982. CALL appears to have originated in the United Kingdom, reflecting a student-centred focus on learning rather than instruction. The earliest documented use of the term CALL that we have found is in a conference paper by Davies and Steel (1981). By 1982 the term CALL was in widespread use in the United Kingdom, featuring in the title of the newsletter CALLBOARD, which was first published by Ealing College of Higher Education in 1982, and in Davies and Higgins (1982). TESOL also adopted the term CALL, setting up its CALL Interest Section (CALL-IS) in 1983 (Kenner, 1996; Stevens, 2003).

An alternative term to CALL emerged in the 1980s, namely technology-enhanced language learning (TELL), which was felt to provide a more accurate description of the activities which fall broadly within the range of CALL (Brown, 1988; Bush & Terry, 1997).
TELL was adopted by the TELL Consortium (now defunct), founded at the University of Hull in 1993, and it figured in the name of the journal CALL-Austria, TELL&CALL (now defunct). The fact that the academic community that was involved in attempts to integrate computer technologies into language learning saw the need to rethink the original term and acronym is indicative of the fact that from very early on theoreticians and practitioners alike saw the potential for enhancing rather than simply assisting language learning and classroom practice when assessing emerging technological applications and tools.

**Early CALL: 1960s to 1970s**

Most of the activity in CALL in its early days took place in the United States. Programs were mainframe-based and primarily served the roles of tutor and drillmaster. These programs were touted as a means to relieve teachers of repetitive tasks in the classroom, allowing them to concentrate on communicative activities, give students immediate feedback on their errors and track student performance, providing remedial work when indicated. Pedagogically, language instruction was still guided by behaviourist models of cognitive theory, which emphasized learning through repetitive practice and negative and positive feedback. The audio-lingual method had emerged to place new emphasis on oral skills, but this method also emphasized drill-and-practice and reflected the continued belief in the importance of grammar, with roots in grammar-translation. Among the highest profile early mainframe projects were the PLATO project (Programmed Logic for Automated Teaching Operations) (Hart, 1995) at the University of Illinois and the TICCIT project (Time-shared Interactive Computer Controlled Information Television) (Anderson, 1976; Jones, 1995) at the University of Texas and Brigham Young University (BYU).

The PLATO project began in 1960 and hit its peak in the mid- to late 1970s with the PLATO IV project. Based on the computing power of a large mainframe computer, the PLATO IV system's most notable features were the plasma graphics terminals, which could display animation and smoothly rendered graphics, including complex foreign characters such as Chinese, its multimedia capability using a computer-controlled audio device, the touch-screen input option, centralized storage and delivery of large amounts of instructional material and an online community space where bulletin board exchanges and multiplayer gameplaying took place. PLATO's advanced technical features foreshadowed a number of key capacities we take for granted in our era of social networking, media-rich information and touch-screen hand-held technologies that increasingly rely on the Cloud for central storage of assets.

Using the TUTOR programming language, curricular materials were developed for many languages, including French, German, Hebrew, Chinese, Latin, Russian, ESL, Spanish, Hindi, Swahili and Swedish. Traditional grammar drill-and-practice lessons coexisted with lessons developed for Chinese tone recognition, German phonetics,
English literature and reading practice. Many PLATO terminals were installed at the University of Illinois, and by the late 1970s over 50,000 hours of language instruction per semester were typically logged (Hart, 1995). Part of the vision for PLATO was to have remote sites connected to the Illinois mainframe and services sold by subscription. PLATO terminals could be based anywhere there was a phone connection for distance time-sharing of the lesson development tools by teachers and of the instructional materials by students. In addition to the specific equipment involved and the cost of the subscription, the long-distance phone charges that accrued when users accessed the system were one of the biggest drawbacks of PLATO and constituted one factor for its lack of success as a viable distance learning option. Although PLATO did not ultimately succeed as a commercial distance education venture, it did succeed as a large-scale instructional platform during the years of its existence, delivering massive amounts of language instruction in multiple languages to an enormous number of students.

The TICCIT project began in 1972 as a joint project of the Mitre Corporation with the University of Texas and BYU that aimed to develop instructional materials for remedial English and mathematics combining computer and television technologies. The system used television to present information and examples. The student would select a desired video choice on the computer, which would send a message to an operator, who would load the appropriate tape and play the program, routing the signal to the television at the student's workstation (Anderson, 1976). Unlike some of the other instructional software of the time that carefully controlled the learner's pathway through lessons and prescribed the difficulty level and help based on performance, learner control was one of the basic tenets that guided TICCIT development (Jones, 1995). Students could move freely through the courseware, able to skip ahead, go back and repeat or ask for more explanation or help on a concept, as desired. Such developments, even when seen from a present-day perspective, can already be described as innovative from an educational perspective too. Developers already had in mind principles which are currently regarded as important ingredients of learning practice, such as self-determined and autonomous learning, flexibility of access or even student-orientation.

In 1977 the original grant funding expired and TICCIT moved to BYU, where it was expanded to include ESL, French, German, Italian and Spanish. (Although the TICCIT name persisted, the television technology disappeared from the system at this point.) Students could visually see what parts of the courseware they had completed and an advisor function made suggestions for what they should do next but, in keeping with the original TICCIT philosophy of learner control, it was up to the student to decide how to use the exercises (which ones and in what order) and which help mechanisms to access. The best-known foreign language work in TICCIT for languages was done at BYU by Randall Jones, who created a comprehensive course for German grammar, which combined tutorials and practice components and continued until 1992, when it was replaced by a microcomputer-based version known as CLIPS (Computerized Language Instruction and Practice Software). CLIPS still exists for English, ESL and
Spanish grammar, and it is available online by subscription offered by a commercial learning software company.

The 1970s saw the production of many other smaller software development projects or mainframes and minicomputers in the United States. These projects included development of authoring tools to create exercises such as CALIS (Hussein, Phelps & Bessent, 1980) and Dasher (Pusack & Otto, 1983–2010) – as well as packaged exercises and tutorials, such as DECU/TUCO (Taylor, 1987), and the Course in Medical and Technical Terminology, focusing on instruction in medical and scientific terms derived from Greek and Latin (Tebben, 1979). It is interesting to note that authoring tools were among the first developments in these early stages of CALL, as they were able to assist teachers in their efforts to provide their learners with more authentic, up-to-date as well as target-group-specific and learner-differentiated content.

In her article reporting the results of her 1978–9 survey on CAI in foreign languages in the United States, Olsen (1980) lists 62 language departments from 52 institutions in 24 of the 50 states as using computers for language instruction. Programs almost exclusively targeted first- and second-year language courses. Predictably, the top three languages for which CAI programs existed were French, Spanish and German, with Latin a close fourth. Many of the departments that responded to Olsen’s survey had indicated that they did not use CAI, citing a number of common reasons, including: cost of equipment and program development; scepticism about the ability of a machine to teach languages; lack of peer recognition of CAI materials development efforts for tenure and promotion; lack of trained personnel; lack of ready-made programs; and the inability of local computing technology to handle diacritical marks or alternate fonts. Interestingly, these problems were to persist for decades, and one of the most frustrating and stubborn issues was to be typing and display of foreign characters.

In the early days of computing, foreign characters were always problematic. Regular terminals commonly used on campuses to connect to mainframes could not display the special characters required for foreign languages. (The PLATO system was an exception, as were a few other special graphics terminals available at the time.) Various conventions were typically used to indicate special characters – for example a vowel followed by a colon indicated an umlauted character or a vowel followed by an apostrophe indicated a character with an acute accent. Even when it became possible to display text that contained foreign characters, it was a long time before any real standardization existed for fonts containing characters beyond those used in common European languages. A multiplicity of foreign character fonts emerged for languages in non-Roman characters, such as Russian, Hebrew and Arabic; and there were even special boards that enabled typing and displaying languages such as Chinese. Solutions were often expensive and usually local – that is, dependent on locally installed hardware and software. With the creation of the Unicode consortium and their efforts over the last 20 years to establish a universal character encoding standard, these issues have slowly been resolved.

There was little significant activity in CALL in the United Kingdom until the early 1980s. Rex Last had been developing CALL materials on a mainframe ICL1904S...
computer at the University of Hull in the late 1970s, using an authoring package known simply as EXERCISE, which was Last's own creation, enabling him to produce large quantities of drill-and-practice activities for students of German. EXERCISE was also used to create materials for students of Dutch. Interesting though they were, Last's materials could not be used outside the environment in which they were created – one of the drawbacks of working on a university's mainframe computer (Last, 1984).

While most of the programs from the 1970s have long since disappeared, a few survived in one form or another into the early twenty-first century due to success in commercial distribution and sustained upgrading to new platforms, including Dasher, CALIS (later WinCALIS) and the Course in Medical and Technical Terminology, as mentioned above. Of course, despite their longevity, these older drill-and-practice programs by no means represent current thinking about the best use of computer technology for language learning. Nevertheless, each generation of CALL has resulted in valuable lessons learned, which eventually filtered down to later adopters.

Each major advance in computing technology has triggered a temporary step backwards in the production and delivery of CALL materials. What had arduously been developed for one dominant technology had to be rethought and reprogrammed for the promising new technology. When microcomputers first appeared, they did not seem to pose a real threat to large mainframes that offered powerful data processing and centralized storage of lessons and record-keeping data. With their 40K of memory and no easily accessible storage for programs and data (floppy or hard disk), early microcomputers seemed more like toys than serious computers. Nevertheless, they quickly grew into the much cheaper platform of choice with graphics capabilities that allowed graphic, animation and foreign character entry and display not available from standard mainframe systems. When the internet and World Wide Web gained traction, developers had to shift gears again, facing problems such as a new generation of underdeveloped development tools and the loss of the ability to control and deliver media with the precision possible with older technologies such as videog disk. Of course, these issues now seem irrelevant, given the advances that produced the social Web that is defined by the mobile devices and creative tools and services that have emerged during the first part of the twenty-first century (O'Reilly, 2005).

This last transition to the Web has also signalled a significant shift in the use of technology for language learning. The exploitation of the technology as a tutor and drillmaster – that is, a replacement for the teacher – has faded into the background, overshadowed by an extensive array of Web-based tools to enable creative and communicative activities. Although there are still tutorial and practice programs, they are now produced as a matter of course by textbook publishers as part of the standard 'ancillary' package. At the same time, faculty developers no longer focus on programming or authoring exercise materials. Instead they have shifted their efforts to the design of activities that incorporate the powerful new communication tools at their disposal (Otto & Pusack, 2009).
CALL and the microcomputer: The 1980s

The impact of CALL and technology-enhanced applications for language learning changed dramatically with the advent of the first affordable microcomputers, which appeared in educational institutions in increasing numbers from the late 1970s onwards. This included primary and secondary schools, which up until this time had little or no access to computers. The first complete CALL packages for microcomputers emerged in the early 1980s, for example Apfeldeutsch (Williams, Davies & Williams, 1981), a substantial set of drill-and-practice exercises for beginners in German, which ran on the Apple II computer. Compatibility between different microcomputers was a major problem at this time. Each microcomputer manufacturer – and there were many of them – used its own operating system, with the result that programs could not easily be exchanged between institutions, and software publishers were unsure about which computer to target in order to achieve reasonable sales. The microcomputer boom period of the early 1980s saw a flurry of publications on CALL (Ahmad et al., 1985; Davies & Higgins, 1982; Davies & Higgins, 1985; Higgins & Johns, 1984; Hope, Taylor & Pusack, 1984; Kenning & Kenning, 1984; Last, 1984). The first professional CALL associations were also founded at this time: CALICO in the United States (1982) and EUROCALL in Europe (1986). EUROCALL was put on a firmer footing in 1993, when it received funding from the European Commission (EU) that enabled it to become a formal professional association.

Early microcomputers had limited graphic options and monochrome displays, but they offered considerable possibilities for text-based practice. In terms of language teaching pedagogy, however, the clock was turned back in the early 1980s, resulting in the production of an abundance of grammar and vocabulary practice programs – drill-and-practice or ‘drill-and-kill’ – in spite of the fact that the communicative approach was by now well established. But some programs were more imaginative, for example CLEF (1985) and TUCO II (Taylor, 1987), offering a semi-intelligent approach, making use of extensive tutorial sequences, discrete error analysis and feedback. Some CALL developers explored artificial intelligence (AI), utilizing semantic and syntactic parsers for processing students’ natural language responses. Among the earliest attempts to produce microcomputer-based AI software for foreign language were the Spanish games for communicative practice, Juegos Comunicativos (Bassein & Underwood, 1985) and the German spy game Spion (Sanders & Sanders, 1995). These programs emphasized the communicative aspects of language, which resonated with current classroom methodologies that focused on proficiency and communicative competence.

Developers of CALL software began to find their feet using the new medium and discovered new pedagogical approaches, which led to the production of text-only simulations such as a Granville: The Prize Holiday Package (Cambridge University Press, 1986) and London Adventure (The British Council/Cambridge University Press, 1986). There were also computerized action mazes, based on printed works such as Berer and Rinvulcri (1981).
Apart from the simulations described above, there were few innovative pedagogical approaches in CALL that arose as a direct result of the use of information and communications technology (ICT). Respondents to Levy's survey of CALL conceptual frameworks, which he concluded in 1991, cited Data-Driven Learning (DDL) – the use of concordancers in the classroom – as the only approach that was 'conceived with the computer in mind' (Levy, 1997, p. 123). This approach was rooted in the idea that discovery-oriented, inductive or concept learning by or from examples might be more fruitful when addressing grammar or vocabulary (Johns & King, 1991). In addition, the tools developed, for example concordancing software or context-oriented learnware such as Johns's appropriately named Contexts program (Johns, 1997), are perfect examples of technology empowering classroom practice with new and additional options that would not have been possible without it.

It is interesting to note that the advent of technology-enhanced learning materials on microcomputers coincided with a rethinking of the methodological framework of language learning in general (Bax, 2003; Warschauer, 1996; Warschauer & Healey, 1998). Trends such as task-based learning (TBL) and cognitive-constructivist approaches gradually found their match in digital technologies, as it was recognized that computer tools might be one option to facilitate the implementation of a methodology for language learning focusing more on authenticity in contents, contexts and tasks. Digital technologies afforded more flexibility in application and exploitation, as these were not restricted, to name but one aspect, by the kinds of linearity in content presentation characteristic of analogue media, for example, audiotapes or videos. Consequently, new technologies started to be seen by some as having the potential to solve a number of practical problems, particularly in more flexibly exploiting authentic resources and exposing learners to 'thinking tasks', rather than pure exercises. This theoretical background did, in fact, stimulate both theoreticians and practitioners. DDL can be summarized as follows:

- a focus on the exploitation of authentic materials even when dealing with tasks such as the acquisition of grammatical structures and lexical items;
- a focus on real, exploratory tasks and activities rather than traditional 'drill-and-kill' exercises;
- a focus on learner-centred activities;
- a focus on the use of computer-assisted cognitive tools, for example text corpora and concordancing software, rather than ready-made or off-the-shelf learnware.

The ideas underlying DDL are, in fact, firmly rooted in some of the English as a Foreign Language paradigms emerging in the course of the 1980s. Most obviously, concepts described as TBL – an approach initially developed in the 1980s by the Indian language teaching specialist, N. S. Prabhu – form a relevant backbone to such developments in
CALL (Prabhu, 1987). There can be no doubt that TBL is relevant to the exploitation of new technologies for language teaching in general as well as DDL in particular. TBL is based on the idea that the acquisition of language and linguistic competence as well as language and language learning awareness can best be realized through tasks which encourage the learner not to focus explicitly on the structure and the rules of the new language. Learners will acquire the form of the foreign language because they are engaged in exploring aspects of the target language on the basis of authentic content. Task-oriented integration of CALL applications into language learning processes, based on constructivist principles, gradually became more common practice, and some of the following examples can be regarded as exemplary for that (Rüsshoff, 2002a, 2002b).

Consequently, CALL developers started to consider options of facilitating the integration of genuine or authentic materials in the language classroom as well as to focus on more genuine and real activities in CALL-enhanced learning practice. Authentic or genuine materials, as Widdowson (1979, p. 80) pointed out, are language samples not constructed for the purpose of language learning. Authentic tasks would then be tasks and learning projects as well as activities of knowledge construction, which truly enable learners to explore the target language in its structure and functionality when working with such genuine 'texts'. Little (1989, p. 5) describes this approach to authenticity in language learning as creating opportunities for the learner to 'psychologically interact' with the target language, 'by which we mean the psychological processing of target language input in such a way that it interlocks with and modifies the learner's existing knowledge'.

Among the innovative uses of new technologies in language learning, tools for the creation of discovery-based and exploratory learning materials rank very highly within a typology of TELL software. One such tool is concordancing software, originally developed as a device to assist research in corpus linguistics. Concordancers can be used with any textual corpus consisting of a potentially unlimited number of texts compiled into a database. Their basic function is to extract lists with contexts of any word or structure entered into the search option, allowing the learner to research 'the company that words keep', as Johns (1986, p. 121) put it (based on Firth, 1957), and to try to discover how language works or what particular terms or vocabulary mean from sample contexts extracted from text corpora. Software such as Oxford University Press's Micro-Concord (Johns, 1986), Longman's Mini-Concordancer and later tools such as Athelstan's MonoConc, provided access to any electronic text and the possibility of conducting a search for the occurrence of particular words, structures or combination of words. These are then listed in contexts lists – so-called concordances. Learners are invited to deduce for themselves the exact difference in meaning, connotation and grammatical features with regard to the key word in context. Grammatical rules can be acquired as well when learners can discover, rather than to be taught, rules by examining many instances of targeted grammatical features. Options for developing learning tasks based on contexts and lists have been described in detail in publications by Johns (1986), Johns and King (1991), Tribble and Jones (1997) and Rézeau (2001).
'Total Co'ze' programs such as Higgins's *Storyboard*, published by Wida Software in 1982, are another example of a pedagogical approach that necessitated the use of a computer. *Storyboard* was derived from Johns's *Textbag* program, in which a whole text is deleted, leaving only punctuation and markers representing the shape of words (Higgins & Johns 1984, pp. 54–7). In such programs the student's task was to complete the text using intelligent guesswork, trial and error and a variety of other strategies as documented, for example, by Trippen, Legenhausen and Wolff (1988). *Storyboard* spawned numerous imitations and spin-offs, including *Developing Tray*, *CopyWrite*, *Eclipse*, *Rhubarb*, *Quartext* and *Fun with Texts*.

At the same time as the development of CALL programs during the 1980s, there was a growth in generic applications such as word-processors, databases, desktop publishing software, spreadsheets and communications software (e.g., email). The increasing availability of these applications – dubbed 'office programs' by Hardisty and Windeatt (1989, pp. 29–46) – led to language teachers discovering innovative ways in which they could be exploited. The use of such generic programs could be considered as a very early step towards the process of 'normalization' of the use of computers in the foreign languages classroom as described by Bax (2003). This can also be concluded from the fact that at this time the first add-ons and tools for word-processors for language learning were developed, which allowed for almost automatic processing of electronic text into worksheets and exercise materials. Such developments, which were started in the 1980s and could be defined as first-generation applications for language teachers, resulted in currently available tools such as *LingoFox*, an application that enables the production of electronic and printed exercises on lexis, orthography, syntax or reading comprehension from computer readable texts in many languages. After detailed parsing of a chosen text, the program provides information about the text, enabling the teacher to determine the difficulty level and to decide on its precise usage in learning. Exercise types range from a variety of gap-filling, cloze and scrambling to games and activities fostering reading and comprehension strategies, all generated from authentic texts.

A major drawback at this time was that microcomputers did not have the capability of recording and playing back sound, although various peripheral devices emerged to meet this need, including the TCCR 530 (Tandberg Computer Controlled Cassette Recorder). The Tandberg TCCR 530 was a modified audiocassette recorder that could be connected to a microcomputer, making it possible to integrate sound into learning materials in a controlled way. While this unit was initially used in more traditional exercise formats, such as listening comprehension tests, the option of integrating simple commands in learning software to play predefined clips quickly led to more interactive ways of integrating sound into CALL software. Learners were, for example, given the option of choosing and replaying alternative versions of a dialogue before dealing with comprehension questions. In addition, selected extracts from such dialogues could be made available as part of the help offered or integrated into the feedback provided by a learning package. This was, of course, a rather crude and – for the software developer – time-consuming way of creating such first-generation
interactive audio-enhanced software, but ideas developed for such systems were quickly adapted to truly interactive digital sound-enhanced CALL software with the advent of sound cards, which began to appear in around 1988.

In the 1980s CALL programs in the United States took on new dimensions with advances in technology, particularly in the proliferation of microcomputers such as the Apple and the IBM PC. Many software packages of this period reflected a shift away from a grammar focus towards an emphasis on narrative contexts, listening, reading and intrinsic motivation through engagement with a game, story and/or an exploratory environment. During this decade interactive videodiscs represented the cutting-edge technology, one that provided easy and precise control over playback of content (video, text, audio and still images). A survey (Rubin et al., 1990) identified 72 interactive videodisc-based programs.

Among the highest profile CALL projects launched in the 1980s were the ambitious videodisc-based simulations that aimed to provide immersion experiences in the target language. The two best-known videodisc-based simulation projects were BYU's Montevidisco, for learners of Spanish, and MIT's A la rencontre de Philippe, for learners of French. In Montevidisco the learner is cast in the role of a tourist in a fictitious town in Mexico and must interact with salesmen, waitresses, policemen and other inhabitants (Schneider & Bennion, 1984). A la rencontre de Philippe wraps up language learning in a real-life simulation set in Paris. The learner must help Philippe, a freelance journalist living in Paris who has just broken up with his girlfriend, find an apartment and help him get a better job. A la rencontre de Philippe first appeared in the late 1980s, having been developed by the Athena Language Learning Project that ran from 1984 to 1989. It was later published by Yale University Press (Furstenberg, 1993), and a version on CD-ROM came out in 2006. EXPODISC (conceived in the late 1980s and published in 1990) simulated a business trip to Madrid in which the learner played the role of assistant to the export manager of a British company (Davies, 1991).

The Domesday videodisc, which was published by the BBC in 1986 to commemorate the 900th anniversary of the creation of the original Domesday Book, was not intended primarily as a resource for language learning and teaching, but the rich collection of authentic texts that it contained, in combination with hundreds of photographs and maps, proved to be invaluable for teachers of English as a foreign language. The main drawback was that it required a cumbersome and unique hardware set-up, combining a BBC Master computer (an upgraded version of the BBC Micro), expanded with a SCSI controller and linked to a Philips VP415 videodisc player. The Domesday videodisc quickly became obsolete, but the BBC has now relaunched the project online (see www.bbc.co.uk/history/domesday).

However, there were only a modest number of videodiscs produced expressly for the foreign language market – in the range of 300 titles, not counting commercially distributed feature films, and the videodisc's failure to thrive in the commercial market led to its replacement in the educational market during the course of the 1990s by other technologies, particularly CD-ROMs, DVDs and, eventually, by streaming media servers.
Repositioning CALL: The 1990s

In the course of the 1990s the use of ICT in language learning and teaching became firmly established, and the use of the term CALL and its earlier associations with drills seemed inappropriate for newer approaches, for example Johns's concept of DDL as mentioned above. Levy, on the other hand, saw CALL in a much wider context, namely 'the search for and study of applications of the computer in language teaching and learning' (Levy, 1997, p. 1), and it is this definition that appears to have been accepted ever since.

When CALL began to reach a wider audience in the 1990s, a number of efforts were made to document its history and to identify its changing phases. Sanders (1995), Levy (1997) and Davies (1997) have already been mentioned. Warschauer (1996) and Warschauer and Healey (1998) identified three phases of CALL, classified according to their underlying pedagogical and methodological approaches:

Behaviourist CALL: In this phase, which was conceived in the 1950s and implemented in the 1960s and 1970s, the computer played the role of tutor, serving mainly as a vehicle for delivering instructional materials to the learner. Drill-and-practice programs were a prominent feature of this phase.

Communicative CALL: In this phase, which became prominent in the 1970s and 1980s, the computer continued to be used as a vehicle for practising language skills, but in a non-drill format and with a greater degree of student choice, control and interaction.

Integrative CALL: This phase was marked by the introduction of two important innovations: multimedia and the Internet, both of which had become prominent by the mid-1990s.

The dates of these three phases can be called into question, however, as pointed out by Bax (2003). Bax offered a different critical examination and reassessment of the history of CALL, defining and describing three approaches to CALL as opposed to the three phases of CALL identified by Warschauer (1996) and Warschauer and Healey (1998). Bax saw the history of CALL in terms of (i) Restricted CALL, (ii) Open CALL and (iii) Integrated CALL, arguing that this allows a more detailed analysis of institutions and classrooms than earlier analyses. It was suggested that in 2003 we were using the second approach, Open CALL, but that the aim should be to attain a state of 'normalization' in which the technology is invisible and truly integrated into teachers' everyday practice.

The advent of the multimedia PC in the 1990s led to programs that were able to record and play back sound, a major breakthrough that language teachers had been waiting for since the first microcomputers appeared. This led to new pedagogical approaches, moving further away from the drill-and-practice programs of the 1980s and earlier. The Brøderbund series of 'Talking Books' CD-ROMs was launched, beginning
with *Just Grandma and Me* (1992), which offered text and sound in three languages, US English, Latin American Spanish and Japanese. The learner could switch between the different languages, read and listen to the texts, and also click on objects on the screen, triggering a range of animations, sound effects and spoken language.

Simulations on videodisc, which had appeared in the 1980s (see previous section), soon began to give way to simulations on CD-ROM, such as *Nuevos Destinos*, companion software to a Spanish telenovela in which the student performs the role of a legal assistant to one of the main characters (Blake, McGraw-Hill College & WGB-H Boston, 1993), and the multilingual mystery game, *Who is Oscar Lake?* (1995). Initially the quality of video on CD-ROMs was much inferior to that on interactive videodiscs, but it gradually caught up. The quality of audio recordings was, however, good and CD-ROMs offered new opportunities for students to engage in listen/respond/playback activities, for example, as in the *Encounters* series of CD-ROMs, published by Hodder and Stoughton and the TELL Consortium in 1997. CD-ROMs incorporating Automatic Speech Recognition (ASR) also appeared around this time, for example Syracuse's *Triple Play* series (later renamed *Smart Start*) and Auralog's *Talk to Me* and *Tell me More* series.

The appearance of the World Wide Web – now known simply as the Web – is probably the most significant development in ICT during the last 30 years. The Web was the brainchild of a British scientist, Tim Berners-Lee, who developed the idea while working at the Centre Européen pour la Recherche Nucléaire (CERN) in Switzerland. Initially a closed system, the Web went public with the launch of the first Web browser, *Mosaic* (1993), which was followed by *Netscape* in 1994. In its early days the Web was used mainly as a tool for locating resources. Most websites offered only texts, but some offered both texts and images. On the whole, however, Web interactivity was very limited, for example to discussion lists and forums. There was a growth of interactive possibilities on the Web when audio and video were introduced, but the quality of audio and video was initially inferior to that offered by interactive videodiscs and CD-ROMs.

The demand for interactive materials on the Web led in turn to a demand from teachers for authoring tools. *Hot Potatoes* (Arneil & Holmes, 1998–2009) is a typical example of a Web authoring tool. The *Hot Potatoes* templates enable the speedy creation of multiple choice, gap-filling, matching, jumbled sentences, crosswords and short text entry exercises. While it can be argued that such exercises are essentially drill-and-practice, this tool proved extremely popular with language teachers and it continues to be used extensively for the creation of interactive exercises and tests on the Web.

‘E-learning’ – usually interpreted as learning online – became the buzz word in the late 1990s, and there was an explosion of virtual learning environments (VLEs), such as *Blackboard*, to serve this need. VLEs proved to be useful in providing teachers with tools to create online courses, together with facilities for teacher-learner communication and peer-to-peer communication. However, they also attracted criticism insofar as the underlying pedagogy attempted to address a very wide range of subjects, and thus did
not necessarily fit in with established practice in language learning and teaching. VLEs continue to be popular, however. The advent of Moodle, an open-source VLE, in the late 1990s has led to the wider adoption of VLEs. The UK Open University, for example, selected Moodle for the delivery of a wide range of its courses, including language courses, making it the largest user of Moodle in the world.

Faster and more efficient internet connectivity became available as the Web expanded, with the result that language teachers could exploit applications that went beyond offering sets of grammar exercises. Such applications included MUDs and MOOs – multi-user domains and multi-user domains object oriented. MUDs were originally designed as text-based, role-playing adventure games to be engaged in across computer networks but they also offered opportunities for collaboration and education, including language learning. Players log into a MOO to communicate with other MOO users either synchronously or asynchronously. Von der Ernde et al. (2001) and Shield (2003) describe how MOOs have been used as language learning tools.

MOOs were followed by MUVs (Multi-User Virtual Environments), three-dimensional virtual environments, which are also known as virtual worlds. Examples of such virtual worlds, which appeared from the mid-1990s onwards, include Active Worlds (1995) and Traveler (1996). Svensson (2003) describes ways in which these 3D worlds could be exploited for language learning and teaching (see also Sadler & Dooley, this volume).

**CALL and Web 2.0: The 2000s**

By the early 2000s the quality of audio and video on the Web had improved considerably, and complete language courses began to appear, notably the range of courses offered by commercial entities, such as the BBC (www.bbc.co.uk/languages/) and by university and government projects, for example Chinese Online (East China Normal University, www.hanyu.com.cn/), LangNet (US Departments of Defense, Education and State, www.langnet.org/) and the CAMILLE Group’s InGenio Project (Universidad Politécnica de Valencia, camilleweb.upv.es/camille/).

It should be noted though that the limitations of complete individualization by means of online self-study courses without guidance and integration had been recognized by this time. This resulted in the fact that ‘e-learning’ was redefined as ‘blended learning’ as it became clear that Web-based activities in a traditional self-study mode could not ‘replace’ classroom practice and social interaction on language learning but would support and extend it.

The term Web 2.0 gained popularity following the first of a series of Web 2.0 conferences initiated in 2004 (O’Reilly, 2005). Essentially, the term Web 2.0 was an attempt to redefine what the Web might potentially achieve or had become: a social platform for collaboration, knowledge sharing and networking. It was not a break with the past but more of a move towards the vision of the Web as originally conceived.
by its creator, Tim Berners-Lee, namely as a ‘common information space in which we communicate by sharing information’ and ‘a realistic mirror (or in fact the primary embodiment) of the ways in which we work and play and socialize’ (Berners-Lee, 1998, n.p.).

From the early 2000s there was a breath-taking increase in the number of Web-based communities that make use of typical Web 2.0 tools such as discussion lists, blogs, wikis and podcasts, as well as dedicated social networking websites and virtual worlds or MUVEs that promote sharing, collaboration and interaction (Thomas, 2009).

A host of Web applications now ‘facilitate participatory information sharing, interoperability, user-centred design, and collaboration on the World Wide Web’ – as the Wikipedia article on Web 2.0 puts it. The ever growing diversity and flexibility of digital media, together with the increased ease with which the communicative, interactive, multimedia and networking potential of computers and the internet can now be exploited, have also had a considerable influence on the way current principles and paradigms underlying foreign language learning methodology can now be put into practice. Current pedagogy advocates collaborative knowledge construction rather than simple instructivist learning, as well as authenticity and task orientation. Furthermore, new opportunities for research into language acquisition processes are opening up, as the tools and platforms available on the Web make traceable both the processes of creating and publishing meaningful output as well as the actual products themselves.

Digital media in their current realization have now become truly creative spaces which have become as naturalized in the real world as radio or television and telephones. In addition, access to personal or shared information has become so much easier than in the past, as tablet PCs, smartphones and other mobile devices have been developed into powerful appliances for daily use. In addition, data shared via social platforms, shared resources in the form of cloud computing and applications such as Dropbox have the potential to make collaborative creation, distribution and sharing of learning materials a regular part of teaching and learning languages. Looking at current trends in language education confirms this perception.

In addition, such platforms and Web 2.0 tools for the publication of text, for example Wikispaces, as well as media products in the form of podcasts or videocasts, such as YouTube, have become a realistic option to broaden the scope of output-oriented project work in language learning. This approach, very much rooted in current thinking in language teaching methodology, appears to be in line with current deliberations within the CALL and TELL community, and digital media are in the process of becoming part of the standard repertoire of language teaching and learning, making output-oriented language learning scenarios with a focus on stimulating meaning negotiation and output production more practical at the grassroots level. As Swain and Deters (2007, p. 831) put it, in language learning ‘participation has found its place alongside acquisition’. Similar to the notion that language learning might benefit from contexts, in which language production results from processes of meaning negotiation, Web technologies and social software are rooted in the idea that knowledge can be accumulated more
fruitfully when negotiated collaboratively by groups sharing a common goal. One of the remaining challenges that needs to be faced with regard to the full integration of digital media into language learning is to define appropriate frameworks for research into the actual processes that learners go through when participating in learning opportunities of the kind outlined in this chapter. Digital media offer new opportunities in this area, too, since participatory platforms and social software tools, such as wikis and podcasting, do offer the option of tracing processes of output-production, thereby making them observable. Consequently, all edits can be considered in terms of what they document and represent as far as acts and processes of language learning are concerned. Research of this kind will allow us to broaden the understanding of the effects and effectiveness of digital media in innovative, creative and participatory language learning.

In 2003 the 3D virtual world of Second Life (SL) was launched, following on from the earlier 3D virtual worlds of the 1990s mentioned above. Second Life soon began to attract the attention of language teachers. In 2005, LanguageLab (www.languagelab.com), the first large-scale language school, was opened in Second Life, and since 2007 a series of in-world annual conferences known as SLanguages have taken place. Cooke-Plagwitz (2008) provides an introduction to Second Life and examines some of the advantages and disadvantages of its use as an instructional tool for foreign language students and educators. Molka-Danielsen and Deutschmann (2009) look at the wider context of learning in Second Life, focusing on instructional design, learner modelling and building simulations (see Sadler & Dooly, this volume).

Conclusions

There is no question that digital media are now having a significant impact on the way foreign languages are being taught and learned. It can now be argued that computer-assisted language learning has come of age, and that we are now entering a fully integrated and naturalized phase of CALL. Digital tools for learning have become integrated elements both in the real world and also in foreign language syllabuses. In view of the development of even more flexible tools for social networking and knowledge sharing, it can be said that CALL has reached the stage of normalization insofar as so-called Web 2.0 applications have become a common social phenomenon.

Nevertheless, the debate on normalization simmers on. In a Special issue of IJCALLT, dedicated to this topic, Bax (2011) now questions the assumption that normalization is both inevitable and desirable, and he asks if normalization occurs to the same degree with each technology and if it follows the same steps for each technology.

Returning to the starting point of this chapter, namely our aim to match technological developments with pedagogical and methodological progress in language learning, one can say that in a number of cases the methodologies and paradigms discussed for quite some time seem to have found their match in recent phenomena observable
in the way technologies are used in real life and language learning. One such example is the concept of process writing, where the focus is more on the process of creating written text rather than the end product, which is a principle underlying the use of and participation in wikis, writing blogs etc., as well as contributing to social networks (see Hegelheimer & Lee, this volume). In technological terms, simple use and consumption has been replaced by participation and contribution, principles which are now also seen as cornerstones of language learning, where 'participation has found its place alongside acquisition' (Swain & Deters, 2007, p. 831). As stated in an article on output-oriented language learning (Rüschoff, 2009), the challenge that needs to be faced, with regard to the full integration of digital media into language learning, is to define appropriate frameworks for research into the actual processes that learners go through when participating in learning opportunities of this kind. Such research would broaden our understanding of the effects and effectiveness of digital media in output-oriented, creative and participatory language learning.

Note

1 To the great sorrow of many friends and colleagues worldwide, Graham Davies passed away on June 20, 2012. Graham was a pioneer in the field of computer-assisted language learning—a smart, funny, creative, entrepreneurial, warm, and generous man, who will be fondly remembered as a dedicated teacher, prolific scholar, experienced software developer and publisher, and exceptional leader in our profession. Although he is gone, his voice can be heard one more time in the pages of this chapter.

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