

CALL RESEARCH: MAJOR THEMES AND ISSUES

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Abstract

Rather than provide a purely subjective perspective on major themes and issues in CALL research, this paper aims to provide an account where, at least in part, the views advanced are drawn from empirical evidence. It is hoped that this approach will provide a more objective description of contemporary CALL research work. To achieve this goal, the present paper is based upon a corpus of 47 CALL research articles published in books and journals in 1999. With this foundation it sets out a framework for the description and analysis of CALL research as it is represented in the literature. Two major directions and three important, though less frequent, directions are described in detail, using examples from the corpus, and the implications for research in the future are considered. Particular emphasis will be placed on identifying the goals of CALL researchers and on clarifying the unique attributes of research in this field.

Keywords: CALL research; major themes; corpus analysis.

Resumo

Ao invés de apresentar uma perspectiva subjetiva sobre temas principais e questões de pesquisa em CALL, este artigo pretende oferecer um relatório em que, pelo menos em parte, os conceitos desenvolvidos são extraídos a partir de evidências empíricas. Espera-se que esse enfoque venha a oferecer uma descrição mais objetiva do trabalho contemporâneo de pesquisa em CALL. Para alcançar este objetivo, o presente trabalho está baseado em um corpus de 47 artigos de pesquisas em CALL, publicados em livros e periódicos de 1999. Com este

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fundamento, apresenta-se um modelo para a descrição e análise das pesquisas em CALL, assim como são representadas na literatura. Dois principais direcionamentos e outros três importantes, porém menos freqüentes, são descritos em detalhes, usando exemplos do corpus; e também consideram-se as implicações para pesquisas futuras. Uma ênfase particular será dada à identificação das metas dos pesquisadores de CALL e ao esclarecimento dos atributos singulares da pesquisa neste campo.

Palavras-chaves: Pesquisa CALL; principais temas; análise de corpus.

1. Introduction

As an interdisciplinary field of study, perhaps it is not surprising that a number of different paradigms, frameworks and models have been suggested to help guide and direct CALL research. Examples emanate from instructed second language acquisition (Chapelle, 2001; see also Egbert & Hanson-Smith, 1999), conversation analysis (Negretti, 1999), socio-cultural models (e.g., Hoven, 1999), work on learner autonomy (Dias, 1999; Murray, 1999b; Söntgens, 1999), immersion theory (Eskenazi, 1999; Price, McCalla & Bunt, 1999), and critical ethnography (Warschauer, 1998).

Situating CALL research and practice within well-defined or established theoretical and methodological frameworks is a way to bring coherence to a field that is sometimes perceived as lacking in focus and direction. The advantage of appealing to more established, cognate fields and disciplines is the assistance such links can provide in formulating research questions or in offering possible research methodologies. However, before any framework is applied to CALL from the outside, so to speak, it would be advisable, of course, to have reached a clear understanding of the CALL literature itself, and the goals and methods used by researchers in the field. This approach takes as its point of departure the notion that CALL research as a body of work is worthy of study in its own right and that CALL researchers are trying to answer legitimate and valid research questions. Given the fact that there are at least four international journals dedicated to CALL and a growing number of books published in the field, these are very

important issues to address. The CALL-1999 project was initiated very much in response to these issues and concerns. This paper summarises and discusses the key findings.¹

The aim of the CALL-1999 project was to systematically describe the CALL literature in 1999 using a specially devised set of descriptors. These descriptors are used to characterize and describe CALL as it was represented in the published work of 1999. The database or corpus for the project included, with a small number of exceptions, all the chapters in four books (Cameron, 1999a, 1999b; Debski & Levy, 1999; Egbert & Hanson-Smith, 1999) and all the articles in four major CALL journals, *Computer Assisted Language Learning*, *CALICO*, *ReCALL* and the online journal, *Language Learning and Technology*. The articles varied widely in terms of goal, length, style and audience; this article limits its attention to the research component of these publications. Of the 177 items published in 1999, 47 focussed on research.

The corpus uses a specially designed thesaurus of identifiers and descriptors to describe the CALL articles in the corpus.² Currently there are 23 identifiers and 136 descriptors and they span all aspects of language teaching, learning and technology pertaining to CALL research, design, development, evaluation and practice. The key identifier used to select the articles for attention in this paper was 'Research New Data'. This identifier is attached to an article if it presents new research data which in some way relates to the language, the learner or the technology in the context of CALL. The emphasis in the research may be upon description, explanation or validation. It also includes rather less formal research projects provided new data is presented and described specifically, and in some detail, not in a general, summative, non-specific way.

2. Description

2.1. Findings: quantitative

Figure 1 provides an overview of the most frequent identifiers used to describe the CALL-1999 corpus. It includes the identifier

'Research New Data', the focus in this paper and represented in the figure simply by the label 'Research', in fifth position.

Design, evaluation and artifact were the three most frequent identifiers in the corpus. The identifier 'Design' was attached in four conditions according to whether the item in the corpus discussed: design as a general, principled approach to CALL (e.g., Levy, 1999b); design of a particular artifact (e.g., Mugane, 1999); design of CALL materials sharing a 'state-of-the-art' technological feature (e.g., Wachowicz & Scott, 1999); or the design of a course delivered via technology (e.g., Curtis et al., 1999). The identifier 'Evaluation' was used when an aspect of CALL is evaluated in a detailed or specific way such as Wachowicz and Scott (1999) on speech recognition, or Mills (1999) and Godwin-Jones (1999) evaluating different Web-authoring options. The other most frequent identifier, 'Artifact', is described in section 2.2.2 as it constitutes a focal point for the discussion in this paper. The other identifiers and descriptors in the figures are reasonably self-explanatory; if more detailed information is needed, the reader should refer to Levy (2000).

Identifiers	Frequency
Design	93
Evaluation	85
Artifact	62
Theory	48
Research	47
Task	36
CMC	34
Course	18
Authoring	18

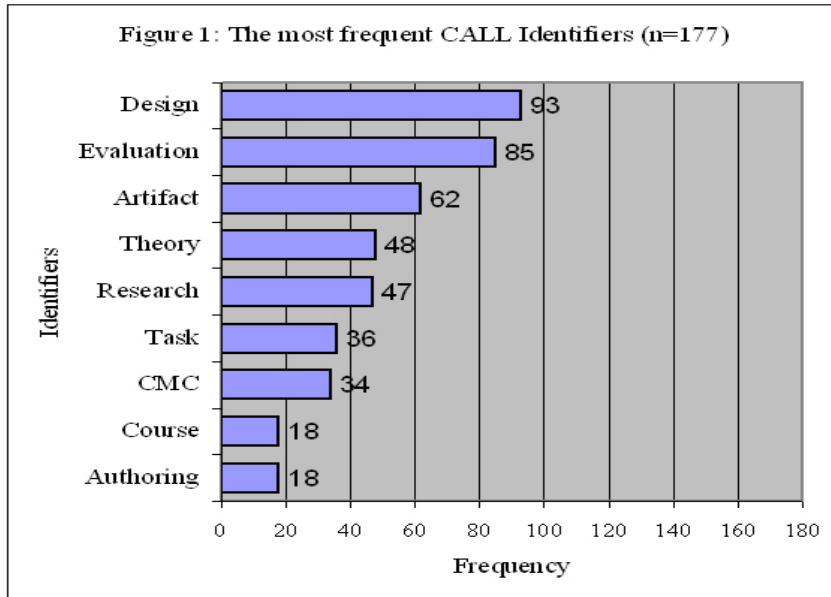


Figure 1

Figure 2 presents the most frequent CALL identifiers and descriptors that occur alongside 'Research New Data'. Thus CALL research is most commonly associated with design and evaluation, and then in positions three and four, Computer Mediated Communication (CMC) and CALL artifacts. This paper will concentrate on research as it relates to CMC-based CALL and artifact-related CALL work; future papers will concentrate on design and evaluation.

Identifiers	Frequency
Design	27
Evaluation	24
CMC	19
Artifact	18
Survey	16
Learning gains	13

Theory	11
www	11
Course	10
Distance learning	10

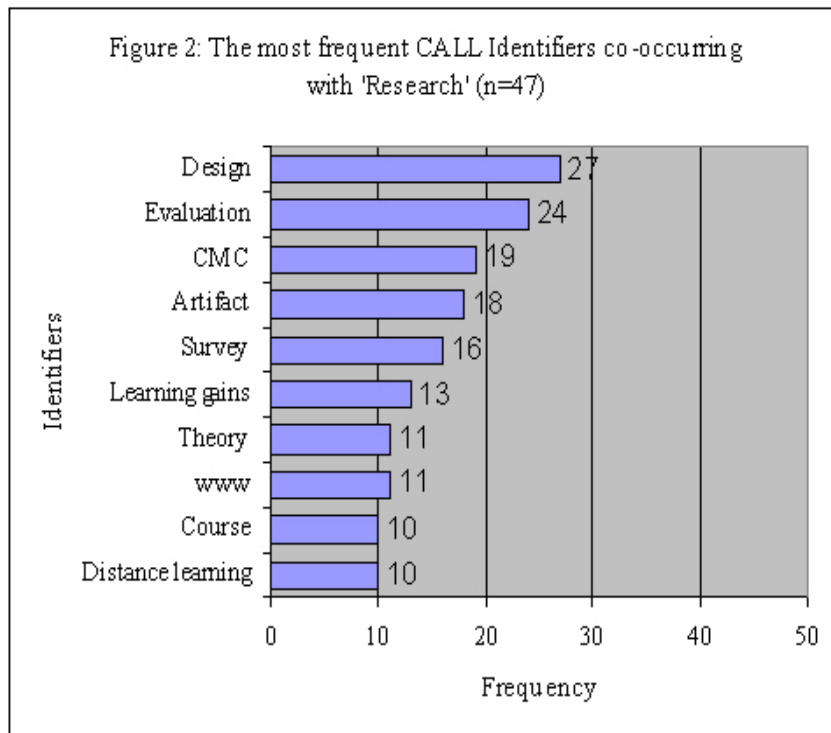


Figure 2

Together, Figures 1 and 2 provide a snapshot of CALL in 1999 as it was represented in the published literature of that year. The figures provide a sense of what practitioners and researchers were concerned with at that time. Of course, interests in CALL will change and evolve over time but, given the large size of the CALL-1999 corpus and its contemporary relevance, an investigation of this kind is considered valuable.³

2.2 *Findings: qualitative*

2.2.1 *CMC-based CALL*

Researchers in CMC-based CALL are seeking to identify and describe the features, dynamics and effects of differentiated CMC modes, separately and in combination. CALL research in this area is primarily descriptive (see Peshkin, 1993, p. 24). Research here also often has a comparative aspect in the sense that it aims to position the features and qualities of the CMC mode vis-à-vis the more traditional and nearest non-mediated equivalent form. Characteristics that are shared and those that are different are typically highlighted. Thus, for example, the Internet chat mode of CMC is compared to face-to-face (FtF) communication by Negretti (1999), and an Internet community is compared to our conventional understandings of a learning community by Mak and Yeung (1999, p. 316). In fact, these two papers are broadly representative of a CMC-based approach to CALL research. They provide useful exemplars also in that the first is an example of synchronous communication (WebChat) and the second is an example of asynchronous communication (email discussion groups).

Mak & Yeung (1999) set out to identify and describe the community features that characterise CMC email discussion groups among a group of ESL tertiary students. In their research they specifically look at “strategies in rapport building, collaboration in learning and evidence of interactive or communicative competence” (1999, p. 319), as well as new roles for students and teachers. (1999, p. 324) Their research brings a very wide range of issues to light, which relate to the successful operation and sustainability of an Internet learning community. This includes factors and issues pertaining to social support, affirmation and agreement, conflict resolution, politeness, commitment, knowledge construction, attention-getting, managing the discourse and speech styles. In all of this, there is an acute alertness to the particular and unique characteristics of the medium. In the research, the CMC mode is treated as a distinct form of communication rather

than a simple extrapolation of the face-to-face equivalent (see Harrington & Levy, 2001). This is further emphasised in the use of the term 'interactive competence' for CMC and in the focus on the compensatory measures that users employ to make up for lack of a shared physical context.

Negretti (1999) follows a somewhat similar path, though with a synchronous rather than asynchronous mode of CMC communication. She looks at the effects of the WebChat medium on conversational interactions, especially in terms of conversational strategies, lexical choices and the expression of paralinguistic meanings. She considers whether WebChat 'implies a reduction in the range of interactional practices, actions performance, sense making, and meaning negotiation, thus affecting the SLA process' (1999, p. 75). Specific features of the mode are distinguished and the differences between a WebChat 'conversation' and an FtF conversation are discussed as in: 'Turns cannot overlap since they are displayed in a vertical sequence, and speakers don't have a chance to negotiate when to start, finish, or give a turn as they would be able to do in face-to-face interaction' (1999, p. 79). Again the CMC mode is considered in and of itself as a new learning context and the medium was found to exert a profound influence (1999, p. 86).

Others members of this group are Blin (1999), Desmarais (1999), Lamy and Goodfellow (1999), Leahy (1999), Paiva (1999) and Söntgens (1999). Lamy and Goodfellow (1999) look at online tutoring strategies using an asynchronous textual conferencing system. Dividing the online tutoring styles into the 'social' tutor and the 'cognitive' tutor, they find that the former is more associated with learner-learner interaction and the latter more with the enhancement of subject knowledge. Clearly, how teachers teach online is going to shape the kind of learning that occurs.

2.2.2 *CALL artifacts*

The identifier 'Artifact' includes any CALL materials that have been specially designed and created for the purposes of language learning. More specifically, 'Artifact' refers to a specific CALL

application of some kind that is described in detail such as 'named' CALL projects (e.g., Brussino et al., 1999), specially constructed Web sites (e.g., Mugane, 1999), CALL programs (Johns & Lixun, 1999), CALL software (Mills, 1999), specially designed exercises (Harben, 1999), a CD (Levy, 1999a), authoring tools (Arneil & Holmes, 1999) and hybrids (Jeffery, 1999). This descriptor is not used for generic applications of technology in the language CALL classroom or outside (e.g., email), or when the computer is used purely as a tool for human-human interaction as in Computer-Mediated Communication (CMC) applications.

Research goals in this group are concerned with testing the effectiveness of an artifact that has been designed and constructed, usually by the authors or their close associates. Typically, when effectiveness research is conducted in this context, it relates to the wider course of instruction, the technology, and/or the learner factors.

What is particularly interesting about the members in the artifact group of CALL researchers is the varied ways they go about evaluating the effectiveness of their work and the multiplicity of methods and techniques employed. For example, the paper by Brussino, Luciano and Gunn (1999) has the "purpose of evaluating the effectiveness of multimedia in language teaching within the context of a specific language-teaching programme" (1999, p. 417). Evaluation objectives focused upon the effectiveness of multimedia in the following areas: in fulfilling methodological principles; in quality terms from a usability perspective; in relation to course objectives; and with regard to theoretical understandings (1999, p. 418). With these goals in mind, data was collected from many sources including questionnaires (addressing wide range of factors), peer review, staff discussions, log-ins and student performance. Importantly, they also add that "Each evaluation method produced a different kind of data..." (1999, p. 419). Such statements lead us to conclude that for researchers to understand CALL more completely they need to organize their research designs and data collection procedures in ways that produce complementary

perspectives. These may later be synthesized to provide a more comprehensive analysis of the phenomena under investigation.

Brussino et al. (1999) provide a good example of a course- or subject-related evaluation of effectiveness. However, another important goal of researchers in the artifact group is the testing and evaluating of new or emerging technologies. In 1999, speech-recognition provided such a focus with a special issue of the CALICO journal, 'Tutors that Listen' (Holland, 1999), dedicated to automated speech recognition (ASR).

Holland, Kaplan and Sabol (1999) provide a good example of ASR effectiveness research with their evaluation of a speech-interactive graphics microworld. They assess the effectiveness of their program in a very different way from the other CALL researchers discussed so far in this section. Their focus is on "the robustness and overall acceptance level of the activity" (1999, p. 347) with a particular interest in student tolerance of the 'inevitable' ASR errors, and limitations imposed by the system on the choice of utterance. Consequently, the data collection focused upon "(a) attitude toward the microworld activity and (b) effect of the activity on language learning" (1999, p. 349).

There is also evidence of a network of approaches in judging the effectiveness of a CALL artifact in this group. For example, Harless, Zier and Duncan (1999) use a three-way combination of evaluation studies: a technological feasibility study; a qualitative (phenomenological) study reporting on speaking, listening, reading, motivation, confidence, and believability of a microworld; and, finally, a quantitative experiment pre-test/post-test experiment on learning gains. Otherwise, effectiveness research when associated with a CALL artifact reflects a diversity of goals and objectives. Many studies show a mixture of quantitative and qualitative approaches to answer a wide variety of research questions (Goodfellow, Manning & Lamy, 1999; Harless et al., 1999; Murray 1999a).

The importance of multiple data sources is evident in many of the researchers looking at evaluating the effectiveness of CALL artifacts (Harless et al. 1999; Holland, Kaplan & Sabo, 1999; Klassen & Milton,

1999; Murray 1999a; Murray 1999b; Tchaicha, 1999). Murray (1999a) provides a valuable discussion of method in this regard. In the context of judging the effectiveness of a CALL artifact, he reflects upon “a configuration of methods — personal language learning histories, journals, video observation, interviews, and pre/post-language proficiency tests...” (1999a, p. 179). He discusses problems with comparative studies, experimental, quasi-experimental designs and think-aloud protocols and concludes:

The point is that none of the research tools employed in this study, when taken individually, appear to offer a great deal of pertinent information. However, configured as a network, narratives, dairies/journals, video observation and interviews produced data which conveyed a picture of the learners’ experience from his/her point of view (1999, p. 191).

Though Murray goes on to say that multiple-method studies have their drawbacks too — especially in terms of information overload and intrusiveness — he does add that CALL research needs the kind of insight that such approaches bring to light.

2.2.3 CALL hybrids

The research goals of those in this group are to understand the workings of artifacts and/or CMC modes in combination. As such, the description of CALL hybrids in this section may be regarded as a special case relative to the previous two sections. Here CALL researchers may, for example, consider how synchronous and asynchronous modes of CMC may be used effectively in tandem. Shield and Hewer (1999, p. 385) talk of ‘hybrid solutions’ in this respect. There were two examples in 1999 both involving Lesley Shield of the Open University. Kötter, Shield and Stevens (1999) seek to establish a framework for the use of certain networking technologies in distance language learning. The CMC mode combination focuses on audio conferencing (synchronous) and email (asynchronous). Questionnaire responses provide “outcomes

in terms of learner perception of and reaction to the combination of media used for the project" (1999, p. 55). The research discusses the media effects of audio conferencing (real time) on the way tutors manage interactions and give feedback, and on the way students interact, especially in turn-taking routines where long pauses can eventuate because no-one knows when to speak (1999, p. 58).

Shield and Hewer (1999, p. 381) look at Internet-based Virtual Learning Environments (VLEs) and describe "the outcomes of the most recent Internet audio and audiographics conferencing trials..." (1999, p. 379). They look at how synchronous and asynchronous exchanges may be used to "engage, motivate and support distance language learners" and report on their students' evaluation of their learning experience with this particular media combination. The LEVERAGE project (Wong & Fauverge, 1999, p. 135) also involves a hybrid learning environment involving '...multi-point video-conferencing and the use of shared chat and editing applications.' The research component of this project focusses on assessing system performance in a collaborative learning context.

This section concludes the descriptive element of this paper covering CMC-based and artifact-oriented CALL research. Before moving on to the discussion section, however, it is important to note that other strands of research work in CALL are clearly evident, both then and now. Good examples in 1999 are apparent in the research concerning teacher education (Debski & Gruba, 1999; Erben, 1999; Koet, 1999; Nunan, 1999) and reading on the Web (De Ridder, 1999; Ganderton, 1999). More recently, a special issue of the journal 'Language Learning and Technology' focused upon corpus-based CALL research, another dimension of CALL that has existed for many years. These research areas within CALL demonstrate that, notwithstanding the size of the CALL-1999 database, certain areas of CALL research were rather poorly represented in that particular year. This paper now continues with discussion, analysis and interpretation, again focusing mainly on the twin research themes of this paper.

3 Discussion: analysis and interpretation

The description of CALL research for 1999 raises many questions concerning the scope, goals and methods of contemporary CALL research. There is not the space to discuss all the aspects here and the arguments presented do not claim to be definitive. They are presented in the hope that they may be sufficiently convincing to encourage further discussion and that they might assist in the development of research questions in the future.

3.1 CMC-based CALL

Whereas artifact design generally sets the computer into the role of tutor for human–computer interaction, CMC-based CALL uses the computer in the role of tool to facilitate human–human interaction. Not surprisingly, the research goals and methods are rather different in focus and intent in each situation.

Computer-mediated communication (CMC) covers a wide range of synchronous (real time) and asynchronous human–human communication forms mediated by the computer. CMC is a growing field of research itself (see Herring, 1996), and is becoming an important platform for CALL research also (see Paramskas, 1999). The difference between the parent field of CMC research and CALL research is that the parent field of CMC focuses on communication rather than learning per se, and native speaker to native speaker (NS-NS) interactions rather than non-native speaker to native speaker (NNS-NS) interactions. Nonetheless, the technological support systems concerned are the same and the focus on description and comparison is very similar.

The most profound questions in CMC-based CALL research, in the first instance at least, relate to problems of description. Descriptive work is important in all CALL research, but especially for CMC-based work. Researchers need to be highly sensitive to the new phenomena that arise in mediated CALL learning environments. Once identified, these phenomena need to be described very carefully using a suitable basis for description. All description is selective and a suitable basis for

description has to be found (see Peshkin, 1993, p. 24). Here is where it can become difficult. The researcher may begin by drawing on existing descriptive frameworks from face-to-face research. But such descriptive frameworks may well prove inadequate because of new phenomena that arise. Also, CMC-based CALL can be described in so many ways and at so many levels, including at least the social, psychological, philosophical, cross-cultural and linguistic aspects.

One can appreciate the importance and complexity of descriptive research in this area and also the caution with which one must treat pre-set descriptive frameworks from face-to-face contexts as all-encompassing. An example helps here. The chatroom is a distinctive CMC mode used for CALL (see Negretti, 1999). Consider the unique qualities of chat on the Internet compared with face-to-face conversation. For the chatroom, typing skills as well as 'conversation' skills are needed, and the interaction is text based rather than spoken. Given that typing skills vary so much, there tends to be a high tolerance for error in chat. Also, users have to be conversant with basic commands. Turns are strictly sequential — there are no overlaps — and responses may be separated from the questions they relate to. Reading rather than listening comprehension skills are critical. The resulting 'conversation' has its own dynamic and rhythm, which is very different from FtF conversation. Levels of commitment and intention can vary, and the whole notion of timeliness of response requires reconsideration. There are many variables that are in play and current research only scratches the surface.

CMC-based CALL needs to differentiate carefully between face-to-face communication and between the various CMC communication modes (see Harrington & Levy, 2001). Face-to-face speech is the only technology-free mode of communication, aside from sign language. All other forms of human-human communication are mediated by technology in some way. Books, Websites, the telephone, email, chat, video-conferencing and so forth all, in their different ways, shape what we say, how we say it and how we process the information presented to us.

3.2. CALL artifacts

The construction and testing of new CALL artifacts is one of the unique, defining features of CALL. From its earliest days, those in CALL have been writing programs themselves or working with others who do so. This activity has flourished and contemporary CALL developers, usually working in teams, are involved in the construction of specially designed multimedia materials and Web-based CALL learning environments (see Bangs & Shield, 1999; Bickerton, 1999; Mills, D., 1999; see also Levy, 1997: 86-88). Thus, CALL is about research and development, as well as research conceived around a ready-made product or generic application such as email or a wordprocessor. In the CALL-1999 corpus, the frequency of CALL research work associated with the creation, development and testing of CALL artifacts was broadly equivalent to those associated with CMC-based CALL research (see Figure 2).

Artifact building can involve more established technologies (e.g., CD—Brussino et al., 1999) or newly emerging ones (e.g., ASR—Harless et al., 1999). Those that deal specifically with an emerging technology that has not reached critical mass, such as the group researching automated speech recognition (see Holland, 1999), typically want to assess the viability of the technology in a CALL context. Thus, Eskenazi (1999, p. 447) examines 'speech interactive CALL', or 'ASR-based CALL', and poses the research question: "Has the technology come far enough for systems to be able to teach pronunciation effectively?". These are legitimate research questions: they need to be asked if the language teaching community is not to be continually 'surprised' by a new technology once it reaches critical mass and very quickly spreads to the population as a whole. This kind of research is long term, not least because of the technological complexities and resource management issues involved.

In fact, in the majority of cases concerning artifact design, development and testing, a long-term commitment (and funding) is involved. Typically the artifact has to be built before it can be tested,

and it was in the testing and evaluation phase of project development that the new research in the CALL-1999 study was manifested.

A point also worth noting is that CALL researchers look at effectiveness in rather different ways from SLA researchers, at least initially. Not surprisingly, the distinctiveness of CALL research is marked by various kinds of assessment that relate to the technology and/or to the CALL environment, rather than to a classroom-based or a naturalistic learning environment. This is well illustrated in the goals of the surveys (questionnaires and/or interviews) that were conducted in a number of the research projects in the CALL-1999 corpus. Surveys were used in 34.0% (16/47) of the projects. In the artifact group, Brussino et al. (1999) used a survey to gather data on student computer literacy and program usefulness; Harless et al. (1999) assessed program believability; Holland et al. (1999) judged program robustness related to automated speech recognition; and Kötter et al. (1999) investigated learners' perceptions and reactions to a particular media combination. SLA researchers would, I think, normally be expected to focus more exclusively on learning gains. In the CALL-1999 project, 27.7% (13/47) of the new research involved measurements of learning gains. As far as CALL is concerned, researchers in this group appear to be gauging reactions to various aspects concerning the design of their programs. Typically, the goal of investigating learning gains, follows.

CALL developers persevere with their development and research work, often with very limited resources and little institutional recognition because, I think, they wish for an alternative to the broad-brush approach taken by commercial developers, and because they want to create something which is focused in its design on the needs of a particular group of learners. They are also driven by a desire to provide students with independent language learning opportunities that are available outside scheduled class times and without the teacher present. The research and development arm of CALL research constitutes an important characteristic of the field and one that sets it apart from other closely-related fields and disciplines.

4. Summary and conclusion

The CALL-1999 project illustrates that it is possible to detect patterns in the goals and directions of CALL research and this paper has focused upon two central thematic strands, CMC-based and artifact-oriented CALL research.

CMC-based CALL research, particularly that involving the use of email and chat for language learning purposes, has a number of goals as far as research is concerned. Researchers are attempting to describe the language produced by L2 learners in these environments; they are also aiming to identify and describe recurring linguistic and sociocultural features of the interactions using different theoretical models and, from there, attempting to establish the implications for language teaching and learning. In this work it is becoming clear that there are important differences in the ways the communication mode shapes the language and the learning that occurs within its boundaries. There appear to be significant differences between the language produced in technology-mediated contexts and face-to-face classroom contexts and much still remains to be discovered about the dynamics of the interactions in the various CMC modes and how the language produced, learner strategies and the learning process might be affected.

A central issue for CMC-based CALL research is the question of whether we view technology-mediated language use as a kind of "rehearsal" for face-to-face interactions, or whether we actually consider student success in these kinds of interactions as our ultimate goal? If our students' main goal is effective communication with NS via email, then, because of its very particular characteristics as a medium, especially in its socio-cultural and socio-linguistic aspects, email communication should feature centrally in our language learning courses and programs. On the other hand, if our students still principally aim to be effective users of the language in face-to-face settings, then the email component would remain a much more peripheral activity in the course.

As more and more students use technology-mediated tools as their primary mode of communication when interacting with native speakers, the need to understand the nature of these interactions will become more and more pressing. Similarly, if hybrids are to be used, NetMeeting for example, where students can employ tools such as video-conferencing, text chat and a shared whiteboard simultaneously, learners will need to know how to make optimal use of the various components and researchers will need to investigate the effects on both the language produced and the learning processes. Also it cannot be assumed that skills acquired in face-to-face contexts will be applicable or will necessarily transfer to technology-mediated communication contexts.

Artifact-oriented research involves the creation and testing of websites, CDs, and courseware for language learning. Usually, though not always, these language learning materials are intended to complement and extend work completed with the teacher in the classroom. Here there are two key questions: the first concerns how best to combine and integrate in-class and out-of-class language learning activities; and the second, relatedly, concerns the identification of language learning goals and the selection of the language content for each setting. Research needs not only to test the effectiveness of the artifacts themselves, but also the effectiveness of the overall language learning environment and the quality of the pedagogical decisions that have led to particular divisions and concentrations concerning the choice of language focus and practice activity in-class and out-of-class. If certain aspects or components of language learning can be covered safely and reliably outside the classroom, then the language content and focus in the classroom may usefully shift to that where the teacher's presence becomes crucial.

Recently, CMC-based work has been receiving the lion's share of the attention in CALL and, when it works well, it is of undeniable value. However, in this kind of CALL there are very significant organizational issues and human factors that language teachers and students have to be able to overcome, and which, if not perfectly balanced, can make

reliable, regular and sustainable contact between native and non-native speakers very difficult to maintain. For instance, we have all heard of key-pal projects that begin very positively but then, later, fail because of the lack of an on-going commitment by one or more partners. That is why artifact-related CALL remains important. If, through motivating CALL materials, students can be encouraged to learn and practice aspects of language without the teacher present, thus enhancing learner autonomy, progress will be quicker and students will attain any given proficiency level more rapidly. Thus, the argument for the development, use and testing of CALL artifacts for independent study is still very important. In fact, both kinds of CALL practice and CALL research are needed. Thus the two kinds of CALL discussed in this paper are best seen as complementary approaches that ultimately serve the same goal.

Overall, CALL research is continuing to help us to understand better the nature and role of technology in language learning and how CALL activity best fits together with more conventional teaching and learning practices. Though by no means easy because of access and equity issues, and the rate at which technology continues to develop, CALL research is slowly but steadily lighting our path and providing practitioners with a reliable basis for pedagogical decision-making and effective language learning.

Notes

- 1 For a more detailed discussion of the CALL-1999 project, especially with regard to the research design, definitions of identifiers and descriptors and the research methodology, see Levy (2000).
- 2 The 'identifiers' were designed to help provide a metalanguage for the description of CALL publications. Typically, identifiers, or 'candidate' descriptors deal with concepts that are difficult to define or circumscribe precisely, at least initially. On the other hand, plain 'descriptors' are more straightforward and unambiguous.
- 3 Compared to the CALL-1999 corpus of 177 items, there were 76 items in the CALL-2000 corpus which was constructed from the CALL literature published

in the year 2000. These items were selected using the same criteria as for the preceding year.

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