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Scope, goals and methods in CALL research: questions of coherence and autonomy

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Abstract

This paper considers the problem of coherence and direction in CALL research. Rather than suggesting a top-down approach to setting goals for research, it argues for a much closer examination and a much stronger emphasis on existing CALL research work as a platform for directing and informing future CALL work. Based on a corpus of 47 CALL research articles published in books and journals in 1999, 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.

1 Introduction

Recently, various paradigms, frameworks or models for CALL research and practice have been suggested. These include instructed second language acquisition (Chapelle, 1997, 1998, 1999; see also Egbert and Hanson-Smith, 1999), conversation analysis (Negretti, 1999), a socio-cultural model (Hoven, 1999), learner autonomy (Dias, 1999; Söntgens, 1999; Murray, 1999b), 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 to formulate research questions in CALL is the clear sense of focus and direction that such an orientation can provide. There is security in becoming part of a larger, more established entity. However, there are disadvantages too. The paradigm or framework provided by the parent field needs to fit the goals and aspirations of CALL researchers and provide valid and appropriate frameworks for the research questions they want to ask. If the parent field does not meet these criteria, CALL researchers may easily find that their

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work is channeled into directions that bypass the most important questions. This is especially important when new paradigms are being suggested for the field (e.g. Chapelle, 1997).

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 goals and perhaps the limitations of CALL research from within. Is there in fact more coherence and direction in CALL research than is at first apparent? Are CALL researchers really a very loosely affiliated group in the research questions they address or are there limited and recognisable themes with more coherence? 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[1] was initiated very much in response to these issues and concerns. This project attempts to collect together a very large sample of CALL publications in 1999 to provide a description of the field at that time. The descriptive process is then twofold. Firstly, it involves creating and applying a unique and specially designed set of descriptors for CALL in order to provide the basis for the quantitative data reported in the study. Secondly, it involves abstracting all the articles in the corpus to provide the foundation for the qualitative analysis in the study.

This approach was considered to have a number of advantages. In 1999, there were a large number of CALL publications. This included four new books and many refereed journal articles, published online and conventionally. Thus, for 1999 a large corpus could be constructed – one that might not be possible in other years – that would potentially provide a representative sample of contemporary CALL work and a recent picture of the scope and direction of the field. A further goal, through the descriptive process, was to endeavour to refine CALL terminology, where appropriate, and to offer new terms for debate. This article limits its field of view to CALL research, a subset of the CALL-1999 corpus as a whole.

2 Method

2.1 The corpus

The CALL-1999 corpus 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 corpus also included articles on CALL in the journal *System*.[2] The

[1] The CALL-1999 project commenced in July 1999 at the Centre for Language Teaching and Research at the University of Queensland, Australia. The project involves the author and a research assistant. This article is the first publication arising out of the project.

[2] The CALL-1999 corpus does not include the following items: papers derived from keynote addresses; book introductions, overviews, conclusions, epilogues etc.; the commentary sections in the *Language Learning and Technology* journal; conference proceedings where a word limit

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distribution of articles in the various publications is given in Table 1; this table also gives the distribution of new research material published. The articles varied widely in terms of goal, length, style and audience, and also it is recognised that the presentation of new CALL research is only one from a number of equally important goals that motivate CALL books and journal articles.

2.2 The problem of description: constructing the abstracts and the descriptors

Once the items for inclusion in the corpus had been finalised, they had to be described through the abstracting process and the use of appropriate descriptors. Effective indexing required the construction of a thesaurus of descriptors or indexing terms. The thesaurus is a comprehensive reference list of words or terms which are used by the indexing system. In this work the introduction to the Educational Resources Information Centre (ERIC) *Thesaurus of Descriptors* (13th Edition) was used as a guide (Houston, 1995) because it is a well-established system that has been designed specifically to describe education-related literature, including books and journal articles.

2.2.1 The abstracts

The abstracting and the indexing were undertaken simultaneously, record by record. The abstracts were written in an informal style. This reflects the practical goals of the CALL-1999 project and the anticipated uses of the management system. The information was organised and managed using the EndNote bibliographic database system.[3] Each abstract included a statement that identified the aim of the article or the goals of the research. Whenever possible this was given in the form of a quote in the author's own words. Direct quotes were used extensively and page numbers were included for future reference by users. Thus, the items in the CALL-1999 corpus were described very much with the goals of the end-users in mind. Otherwise, the content of the abstracts focused on describing important aspects of the work. CALL-related matters given particular emphasis were: research in CALL, especially in terms of goals, frameworks, theories and methodologies; the scope of CALL; problems in CALL; matters pertaining to new technologies; and teacher and learner issues and roles. All items in the corpus were abstracted by the author, and the author bears responsibility for any errors of fact or omission.

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has been applied; and articles in languages other than English, except for two articles written in French, but abstracted in English in the *CALL journal* (Desmarais, 1999; Pellerin, 1999). To my knowledge, other articles not included are those in the special technology edition of the Australian TESOL Journal, *Prospect* (14, 3), and all articles for 1999 in the CALL-EJ Online journal.

[3] The EndNote data file (Mac, version 3.0) containing the 177 abstracted items from the CALL-1999 corpus is available free of charge from the author (mlevy@cltr.uq.edu.au) with the conditions that it is for personal use only and that if reference is made to the corpus, the author is acknowledged in full. Currently a Web version of the corpus is under construction. Details of availability will be given on the author's Website, `http://www.cltr.uq.edu.au/users/mike.levy/`.

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2.2.2 The descriptors

The thesaurus of descriptors or set of indexing terms for this project was created and refined in a cyclical manner as the items in the CALL-1999 corpus were read, indexed and abstracted. The descriptors spanned all aspects of language teaching, learning and technology pertaining to CALL research, development, evaluation and practice. The descriptors were of two kinds: 'candidate' descriptors, or 'identifiers', and straightforward descriptors.

The 'identifiers' were designed to help provide a metalanguage for the description of CALL publications. The label 'identifier' is a term borrowed from the thesaurus of ERIC descriptors (Houston, 1995: xx). Identifiers are 'candidate' descriptors that deal with concepts not yet fully determined. Typically, identifiers are difficult to define or circumscribe precisely, at least initially. In the ERIC Thesaurus, for instance, 'Freedom' and 'Happiness' are examples of former identifiers that now appear as descriptors.

In this study, the identifiers were intended to help classify the CALL article as a whole. They were intended to capture the essential nature, content and shape of the article. For this, the wording of the title was considered carefully, and particular attention was paid to the content of the introduction, conclusion and any summary sections. In relation to this particular paper on CALL research, 'Research-new-data' and 'Artifact' are the principle identifiers offered for consideration; the descriptors 'Theory', 'Technology', 'Hybrid' and 'Environment-IT' (Information Technology) are also suggested. In this paper, for the sake of brevity, only the scope notes for these identifiers are given (see Appendix A).

The identifiers make use of extensive 'scope notes'. Scope notes are an established technique in thesaurus construction (see Colby, 1992; Houston, 1995; Miller & Findlay, 1996). As its name suggests, the scope note is a statement describing the intended meaning or usage of the term. The scope note may provide a definition, specific user instructions or both (see Colby, 1992: viii). It may also be used to clarify an ambiguous term, identify any mutually exclusive items, or other usage with regard to related terms. Typically there are also warning notes about where and when not to use the term. For the purposes of this paper, just six identifiers were invoked. In the CALL-1999 corpus as a whole, currently there are 23 identifiers and, on average, two to five identifiers were attached to each record.

The plain descriptors used in this study were more straightforward than the identifiers because the correspondence between the concept or term in the article and the label that was used to describe it was more concrete, direct and unambiguous. For example, 'email' was discussed in many articles and 'email' was a descriptor, so attaching this descriptor was not problematical. However, if terms were mentioned only in passing, with no further reference, they were not included. In the corpus as a whole, currently there are 136 descriptors and approximately five to ten descriptors were attached to each record.

Otherwise, the descriptors were refined in an iterative fashion as the articles were read. A particularly useful technique to check the applicability of a particular descriptor for a record was to search the whole corpus using that descriptor, and then compare the article in focus with the other articles located. Then, before the descriptor was finally attached, the usage could be cross-checked and examined for consistency. This technique was used on numerous occasions during the development and allocation of the

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descriptors, and the appropriate adjustments were made. In addition, another cross-check was made after completing the preliminary selection of all the descriptors for an article: the group of identifiers and descriptors as a whole was then carefully considered for balance and representativeness. Every effort was made to look at the descriptor set as a whole and consider whether it constituted a fair reflection of the goals, structure and content of the article at the macro and micro levels.

Finally, the allotment of the six identifiers and the allotment of the descriptors were cross-checked independently by a second researcher with a view to improving reliability. Twenty articles (11.3%) were chosen at random from the CALL-1999 corpus and coded a second time by this researcher. There were two differences of opinion in the allotment of 'Artifact' and 'Research-new-data' from a total of twenty occasions when these two identifiers were applied; these differences were easily resolved. With the remainder, extensive discussion occurred. The discussion had four possible outcomes which, when finalised, were implemented across the entire corpus: the identifier or descriptor was deleted if it was too broad (e.g. 'CALL-materials'); the identifier was renamed if its meaning proved confusing (e.g. 'Application' was replaced by 'Artifact'); the item was absorbed under another descriptor if there was unnecessary ambiguity or overlap (e.g. 'role-play' was included under 'simulation'); or more extensive scope notes were provided to help resolve differences in interpretation (e.g. 'Technology').

2.3 Assumptions and limitations

The intention in this paper is not to provide the definitive description of CALL articles published in 1999. Without more sophisticated methods of content analysis, the author does not believe this to be possible. The present method is, however, a step beyond using individual perceptions and opinions about the current focus and direction of CALL research, and provides a counter-argument to sweeping statements about the status and goals of CALL. The author believes the parameters involved and the methodology provide reasonably accurate indicators. It was indeed possible to apply 'Artifact' and 'Research-new-data' accurately in the items tested. Also, and very unusually, the data that forms the foundation for this study – the articles that constitute the CALL-1999 database – is publicly available to all those who are interested. Ultimately, therefore, the strength of the case presented here very much rests with the reader.

The methodology used in this study is still being refined and cross-checked. Every effort has been made to make the approach taken here as transparent as possible, to describe the procedure clearly and to make available the method and results so that the approach may be scrutinised by others.

3 Description: quantitative

In the CALL-1999 corpus, there are 177 journal articles and book chapters. Not surprisingly, the items in the corpus cover a wide range of issues relating to CALL, including works focusing on research, theory, method, design, new technologies, evaluation and practice. New research data was presented in 47 items (26.6%) as indicated by the identifier, 'Research-new-data'. Table 1 shows the distribution of these items in the books and journals in the CALL-1999 corpus.

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Table 1 *Distribution of CALL research in books and journals in the CALL-1999 corpus*

Publication	No. of items	Frequency of 'Research-new-data'
Journals		
CALICO	22	4
Computer Assisted Language Learning	22	14
Language Learning & Technology	6	3
ReCALL	27	6
System	2	1
Books		
Cameron (1999a)	12	1
Cameron (1999b)	40	12
Debski & Levy (1999)	19	6
Egbert & Hanson-Smith (1999)	27	0
Total	**177**	**47**

Table 2 presents the most common identifiers and descriptors appearing with 'Research-new-data'. In the table, the identifiers are in capital letters and the descriptors are printed in lower case; this is also the convention used in the EndNote bibliographic database itself. It is worth noting that in the CALL-1999 corpus as a whole there were 61/177 (34.5%) items focusing on CALL artifacts and 47/177 (26.6%) involving Computer-Mediated Communication (CMC). CMC is 'communication that takes place between human beings via the instrumentality of computers' (Herring, 1996: 1). It includes email, chat, text-based-conferencing and video-conferencing and discussion lists, and each of these communication modes has been allocated a descriptor in the thesaurus.

Clearly, a discussion of research in CALL could be approached from a number of directions. Possible perspectives might include those that centre upon theory, curriculum, new technology, or research design. Further, in this study, identifiers such as 'Design' and 'Evaluation' look promising and appear to have wide application. However, 'Design' may be applied in relation to software development, a course, a model of CALL and a genre of programs sharing a technological feature; and 'Evaluation' is very difficult to define and to circumscribe convincingly, so both have been omitted at this stage. Here, simply, the two highest frequency counts were used to provide a foundation. Thus, CMC-based CALL and artifact-related CALL provide the twin bases of the discussion that follows.

The question still remained of how best to handle items not covered by the 'cmc' and 'Artifact' descriptors. Again the remaining material was considered from a number of perspectives. After careful reflection, researchers who looked at CALL as a distinct approach or method appeared to form a group with the majority employing comparative designs. Articles in this group had been coded with the 'Environment-IT' and/or the 'comparative-design' descriptors. In addition, a number of articles clearly and exclusively focused on pre-service or in-service teacher education, and

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Table 2 *The most frequent identifiers and descriptors accompanying 'Research-new-data'*

Descriptor	Frequency	Percentage
Identifiers		
ARTIFACT	18	38.3
THEORY	11	23.4
ENVIRONMENT-IT	8	17.0
TECHNOLOGY	6	12.8
HYBRID	5	10.6
Descriptors		
cmc (CMC)	19	40.4
survey	16	34.0
learning-gains	13	27.7
vocabulary	11	23.4
www (WWW)	11	23.4
course	10	21.3
distance-learning	10	21.3
reading (skill)	9	19.1
motivation (learner)	9	19.1
email	8	17.0
collaborative-learning	7	14.9
role-teacher	7	14.9
autonomy	7	14.9
listening (skill)	7	14.9
role-technology	6	12.8
conferencing	6	12.8
comparative-design	6	12.8
curriculum	5	10.6
chat	5	10.6
sla (SLA)	5	10.6

they formed a clearly defined group also ('teacher-education'). Two other articles on the effects of new technology on reading also appeared to be distinct and not easily attributed to any other category (De Ridder, 1999; Ganderton, 1999). The outcome of this line of thinking is given in Table 3. 'Hybrid' follows CMC and artifact because this is the logical point for discussion given the definition of a CALL hybrid. It is also acknowledged that there is a degree of subjectivity in the derivation of these themes.

The categories in the table above will be used to frame parts four and five of this paper. In part four, each section will be headed with a short description and overview of the goals and focus of the research in that category. This will be followed by one or two specific examples of research papers that exemplify the goals and approach. When the findings of a research study are especially relevant to the broader discussion, they will be briefly summarised. In part five issues arising from the descriptive analysis will be explored and discussed. All 47 studies with 'Research-new-data'

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Table 3. *Derived themes (objective and subjective) in CALL research*

Research focus	Frequency	Frequency in mutually exclusive categories
CMC	19	9
Artifact	18	14
(Hybrid)	5	5 (incl. 5 CMC, 3 Artifact)
Environment/comparative evaluation	9	9 (incl. 3 CMC, 1 Artifact)
Teacher education	4	4 (incl. 2 CMC)
Hypertext/reading	2	2
Other	4	4
Total	–	47

attached are included in the discussion with the exception of the items listed under 'Other'.[4]

4 Description: qualitative

4.1 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: 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 & Yeung (1999: 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: 319), as well as new roles for students and teachers (1999: 324). Their research brings a very wide range of issues to light, which relate to the successful operation and sustainability of an

[4] All new CALL research has been mentioned in the appropriate sections relating to Table 3 except for those articles labelled 'Other'. The articles are: Dodigovic (1999), Herselman (1999), Jacobs & Rodgers (1999) and McCreesh (1999). The decision to classify these articles under 'Other' demonstrates the limitations of my classification system and is no reflection on the high quality of these studies.

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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: 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: 79). Again the CMC mode is considered in and of itself as a new learning context: the medium was found to exert a profound influence (1999: 86).

Others members of this group are Blin, O. (1999), Desmarais (1999), Lamy & Goodfellow (1999b), Leahy (1999), Paiva (1999) and Söntgens (1999). Lamy & Goodfellow (1999b) 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. Blin looks at wider societal effects of CMC by considering whether email perpetuates social differences; she does this by establishing profiles of the typical email user. Leahy (1999) looks at the construction of knowledge online and whether CMC via computer-assisted class discussion can improve communicative language proficiency. Paiva (1999) focuses on the nature of interactions and describes the features and effects of email interaction and chat compared with second-language classroom interaction. Thus, in terms of interaction, we see the computer-mediated versus non-computer-mediated comparison again. Also Söntgens (1999) considers an email discussion forum and an email tandem exchange and the degree to which the different CMC modes support collaboration and reflectivity (1999: 414). Söntgens' (1999) work illustrates again the importance of differentiating between CMC modes. Finally, Desmarais (1999) considers attrition rates in a distance learning course using email to improve writing skills and Gillespie & McKee (1999) investigate the reasons for student resistance to the use of conferencing in CALL.

4.2 CALL artifacts

Research goals in this group are concerned with testing the effectiveness of an artifact

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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. A CALL artifact can include any materials that have been specially designed and created for the purposes of language learning (see Appendix A). These include 'named' CALL projects, Web sites, CDs, CALL software and courseware and authoring tools. The nine named research and development projects in 1999, that is those named artifacts labelled with 'Research-new-data' and 'Artifact', are shown in Table 4.

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: 417). In this case the artifact is called 'Crescendo in Italia' and comprises six multimedia CDs. Brussino *et al*. reject a purely statistical approach in judging effectiveness (Brussino *et al*., 1999: 418) as do the majority in this group. 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: 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: 419).

Brussino *et al.* 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 & 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: 347) with a particular interest on student tolerance of the

Table 4. *Named projects in the CALL-1999 corpus (research only)*

Named CALL projects	Author(s)
'Business English'	Klassen & Milton, 1999
'CALL-KQ'	Van Aachen, 1999
'Crescendo in Italia'	Brussino *et al*., 1999
'CrossTalk'	Levy, 1999a
'L2tutor'	Price *et al*., 1999
'LEVERAGE'	Wong *et al*., 1999
'Lexica Online'	Goodfellow *et al*., 1999
'PET•2000'	Cobb, 1999
'VINCI'	Lessard & Levi, 1999

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'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: 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 & 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 and Lamy, 1999; Harless *et al*., 1999; Murray 1999a). Goodfellow (1999) for example, investigates two psychology-related questions (related to the design of the system) and two student-learning-related questions in his research on the effectiveness of the Lexica vocabulary acquisition system. Thus, the effectiveness question is considered both from the designer's and the learner's point of view. In artifact effectiveness research, many authors stress the importance of assessing the artifact from the learner's point of view rather than the designer's to gauge the 'way a learner experiences their learning' (Goodfellow, 1999: 113). Thus, from the learner's perspective, Klassen & Milton (1999) look at attitudes and changes over a period of program use, Brussini *et al*. assess program usefulness, Holland et al. consider program acceptance, Van Aachen (1999) examines learning strategies and motivational qualities, and Tchaicha (1999) looks at aptitude. Questionnaires and interviews are the primary method of data collection for this group although, as discussed above, many researchers use a number of further data collection methods as well to strengthen and to cross-check the data before conclusions are made.

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; Murray 1999a; Murray 1999b; Klassen & Milton, 1999; 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: 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, diaries/journals, video observation and interviews produced data which conveyed a picture of the learners' experience from his/her point of view (1999a: 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.

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4.3 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 & Hewer (1999: 385) talk of 'hybrid solutions' in this respect (see Appendix A). 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: 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: 58).

Shield & Hewer (1999: 381) look at Internet-based Virtual Learning Environments (VLEs) and describe 'the outcomes of the most recent Internet audio and audiographics conferencing trials... (1999: 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: 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 focuses on assessing system performance in a collaborative learning context.

Hybrid environments can also include particular CALL artifacts. In this case, a CALL artifact is typically combined with email and other tools to provide a learning environment (see Goodfellow, Manning & Lamy, 1999; Lamy & Goodfellow, 1999a). Thus Goodfellow *et al*. (1999: 272) describe Lexica Online as an open and distance language learning online environment. Lexica Online comprises online discussion, an electronic dictionary and Lexica Vocab, where Lexica Vocab is the 'core of the environment' and 'a standalone program', that is the CALL artifact.

4.4 The CALL environment

The researchers in this group aim at testing the effectiveness of a CALL *vis-à-vis* non-CALL learning environment. This group view CALL as a whole, though it may comprise a variety of CALL programs or Web-based resources. Even when CALL programs are named, as in Dias (1999) or Chung (1999), e.g. the CALL component is treated very much as a whole, indivisable entity, or as a special method in the research that is undertaken. In this group, comparative studies are common where the experimental group (CALL users) is typically compared with the control group (conventional non-CALL users).[5]

[5] The efficacy of comparative studies is not discussed here because the topic has been covered in detail elsewhere in the CALL literature. For more information see Pederson (1988), Dunkel (1990), Chapelle & Jamieson (1990) and Murray (1999b).

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Thus, Chiao (1999) describes a study designed to examine improvements in proficiency in English as a result of network instruction using the Internet and the Web. The teaching activities for the experimental group held in the computer lab are compared with a control group who worked in a conventional classroom and a language lab (1999: 41). Another example is Pellerin (1999: 381) who looks at 'the effectiveness of CALL' through a two group comparison: in this case Group One had four hours in the classroom and one hour in the computer lab whereas Group Two had three hours in the classroom and two hours in the computer lab. In another example, Dias (1999) conducts a comparative study researching the effects of an Information and Communication Technology (ICT) environment on student attitudes and behaviour. In this case, the computer activities involve a Web browser, a wordprocessor and unspecified activities made with HyperStudio and HyperCard. Though not a comparative study, Gu & Xu (1999) also look at CALL as an undifferentiated whole. Their research looks at 'networking' and whether it has an optimising impact on the conditions for an ideal language learning environment. For similar reasons, Fleta *et al.* (1999), Levine *et al*. (1999), Chung (1999) and Tchaicha (1999) also fit well within this group.

4.5 Teacher education

The research goals of those in this group test the effectiveness of new technologies with regard to language teacher education. Four research studies in 1999 show that new technologies are making inroads into pre-service and in-service teacher education courses (Debski and Gruba, 1999; Erben, 1999; Nunan, 1999; Koet, 1999).

More specifically, Debski & Gruba (1999: 233) examine language teachers' reactions to project-based CALL and draw the important conclusions: 'Most instructors felt that CMC technologies should be used only in situations that truly demanded them' and, further, 'Without a doubt, instructors noted, students preferred face-to-face contact in the classroom.' Erben (1999) looked at LOTE (Languages Other Than English) immersion education through audiographics. Eighty percent of this four-year Bachelor of Education degree is delivered in Japanese. Nunan (1999) describes a Web-based Master of Science program in TESOL and the research aspect focuses on the potential of the Web for providing graduate level programs. Again, interestingly, like Debski and Gruba, '...all of the participants...believe that distance learning, whether supported by Web-based interactions or not, is second best to the opportunities provided by face-to-face instruction' (1999: 71).

4.6 Technological effects on reading & writing

The modes of communication under the CMC label do not encompass all the non-directive uses of the computer. The computer may also be used as a tool (i.e. the computer does not evaluate user input) when the user simply wants to use the technology to read or write. Thus, in writing, for example, a wordprocessor or Web editor may be used to produce text, or with reading, a database, archive or Web site may be used to read text. This all sounds rather obvious. What is important to appreciate is that the technological environment provides new contexts for reading and writing, and this new environment has the effect of changing many aspects of the reading and writing process when compared with more traditional forms.

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In the 1999 corpus used as a reference here, reading on the Web was the focus in two CALL studies (De Ridder, 1999; Ganderton, 1999). De Ridder (1999) explored the effects of highlighting words in hypertext on incidental vocabulary learning and considered whether 'the random highlighting of words disturbs the natural structure or organisation of the text in such a radical way that it prevents learners from inferring word meanings from context?' (1999: 106). The study compared two kinds of text-reading comparing a marked or highlighted condition with an unmarked condition. Students clicked much more frequently in the marked condition and of this she concludes: "What started as 'reading' has more than probably become 'clicking'" (1999: 113). This important conclusion for literacy on the Web is discussed further in section five.

5 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. However, this section does aim to explore some of the major themes and issues emerging, particularly those that help define the unique qualities of CALL research, as opposed to cognate areas such as SLA. The arguments presented here do not claim to be definitive. They are presented with the hope that they may be sufficiently convincing to encourage further discussion and debate. The structure of the discussion broadly follows that in the last section: CMC-based CALL research is followed by artifact-related research. Next there is a broader consideration of the De Ridder study and the question of generalising in CALL research.

5.1 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 is that the CMC focuses on communication rather than learning *per se* and native speaker (NS) interactions rather than non-native speaker (NNS) 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. As descriptive research is a crucial part of the CMC-based CALL research agenda, it is worth a few words of discussion in its own right.

Descriptive research precedes the research that has as its goal explanation or validation (Krathwohl, 1993: 5). Descriptive research is creative in important ways and Krathwohl says that it 'incorporates creativity first in perceiving important aspects of a situation missed by others and second in organising and presenting that

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perception...richly and vividly...'. It also involves labelling important phenomena (Krathwohl, 1993: 6). Though descriptive research is sometimes maligned as a rather inferior form of research, as Peshkin observes, we need to fully appreciate the 'foundational character of good description for all research...' (Peshkin, 1993: 24). Peshkin continues: 'Clearly, the soundness of the nondescriptive and prescriptive aspects of research rests essentially on what has been provided by the accuracy, sensitivity and comprehensiveness of its descriptive foundation' (1993: 24). This point is reinforced by Krathwohl who adds, 'often the test of an explanation fails confirmation because it rested on faulty or inadequate description...' (Krathwohl, 1993: 7).

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: 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.

There are many other considerations too, when reflecting upon the goals and design of CMC-based CALL research. These concern, firstly, the importance of distinguishing between the CMC modes and, secondly, the importance of understanding the ways in which technology can influence and redefine the goals of language teaching and learning.

CMC-based CALL needs to differentiate carefully between face-to-face communication and between the various CMC communication modes (see Harrington and 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. Speech and writing are employed in various ways across these modes of communication, which may be synchronous or asynchronous.

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In language teaching and learning we typically assess competence in speaking and writing separately, and we routinely assume that one can have a level of competence in one that is not matched in the other. Aside from FtF interviews for assessing speaking and listening skills, certain technologies are always employed in assessing students, from pen and paper exams to assess writing, for example, to computer-adaptive testing. Extending this argument, it is logical to assume that a level of competence in one communication mode may not be attained in another. For example, a student may achieve a level of competence with email that is not reflected in pen and paper essay writing or face-to-face conversation. There are many occasions when we do not conflate speaking with writing and assume one kind of broad-based competence. Similarly, we should not conflate the CMC modes, either one with another or with FtF speech or paper-based writing. CMC-based CALL research needs to be designed in such a way that it is highly sensitive to the mode of communication so simple extrapolations from face-to-face contexts should be avoided.

Flowing from this argument, there is a much bigger question too, one that was first articulated, rather prophetically, by Nina Garrett in 1990 (p. xv): 'Do we accept without question that the characteristics of spoken language and the requirements of face-to-face communication should constitute our highest teaching priorities?' This question is becoming increasingly pressing. If our students aspire to becoming successful language users in face-to-face situations, then the use of CMC modes such as chat are perhaps better regarded as rehearsal for real interactions (see Levy, 1997: 207; Shield & Hewer, 1999: 381). Here then the issue of transfer is critical (see Levy 1999a: 42–43). However, it is entirely possible that a growing proportion of students will interact with native speakers only in computer-mediated language-learning environments, through email, chat and video conferencing, and that competence in that area will become their declared aim. Anecdotal evidence suggests distance language learning is increasing. In the research component of the CALL-1999 corpus, distance learning was discussed in 21.3% (10/47) of items. For overseas students, especially perhaps those in the business community, it is mediated rather than face-to-face interactive competence that is required. It thus becomes very important to know precisely what the learning goals of our students are. The language itself, the ways students learn, and the goals of our students are changing with the technology. We must not forget that technology can move the goal-posts. This is one reason the study of CALL is so important.

It also needs to be remembered that distance learning is currently being ardently embraced by universities around the world. This interest extends far beyond those universities whose specific charter emphasises distance learning, such as the Open University in the UK. Some learners clearly prefer learning at a distance, or their location necessitates distance learning. However, for those students who prefer face-to-face learning – and two research studies in the CALL-1999 corpus clearly identified this preference when a choice is offered – there may turn out to be no option but to learn a language at a distance. Thus, for many in CALL who believe, as I do, that to genuinely enhance learning a combination of face-to-face and distance learning is optimal, we may be left without this alternative unless a strong case against the distance only option is presented. Those in CALL need to be very clear about their position, and the more substantial the research base to back this up the better.

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5.2 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 Higgins and Johns, 1984; Bangs & Shield, 1999; Bickerton, 1999; Mills, 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 Table 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: 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 directly 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 investigation of learning gains may follow, or may be the ultimate goal.

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As far as theory is concerned, for the CALL developer, if a theory is to be useful in the development of a CALL artifact, it needs to be context appropriate, specific and robust (Carroll, 1991; see also Levy, 1997: 216–221). For applied CALL work, theories of SLA have been problematic because they do not meet the specificity requirement (Carroll 1991). In this regard, according to Holland (1999), CALL developers rarely refer to theories of SLA for the purposes of applied CALL research and development. Holland (1999: 247) states:

> Although there is a science of learning and instruction generally, and of second language acquisition specifically, CALL developers rarely refer to it. When they do, they find that the theory and the research have not reached a precise enough level to guide many of the detailed decisions about exercise design, sequencing and feedback.

Using theory as a point of departure for investigating the success or otherwise of pre-existing CALL applications is of an entirely different order to utilising theory as a point of departure for CALL design and development. For applied CALL development purposes, if theory is to be useful it has to be sufficiently detailed and applicable to the context to be successful (see Carroll, 1991; Levy, 1997, 1999b). As with CMC-based CALL, it seems that SLA theory can provide an important point of departure, but the value and range of its applicability after that is questionable.

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 a particular group of learners. This research is of a different kind from that which involves the use of off-the shelf products, or describes and tests generic applications. 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.

5.3 Pragmatic validity

This section relates to De Ridder's 1999 research study described earlier and some critical questions for CALL that arise from it. In her study, De Ridder concludes:

> ...when CALL introduces new technical possibilities, these should in fact be evaluated closely. What started as reading, might just as well become 'just following links' (De Ridder, 1999: 115).

Aside from the issue of who exactly is introducing the new technical possibilities, (and here I do not believe the CALL community is entirely responsible) in this statement one can perceive a sense of frustration that those in CALL are not properly evaluating new technologies or controlling their use. But to what extent is this possible?

Hypothetically, let us say De Ridder is proven correct, in other words that the De Ridder study has been replicated a number of times, and that CALL research shows that reading on the Internet is essentially just clicking or following the links. Will these

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research findings make a difference? This brings into question the 'pragmatic effect' of CALL research (see Miles & Huberman, 1994: 280). How do the research findings change practice, even if findings are proven valid and transferable? These are crucial questions for CALL because CALL research is, on the whole, responding to a technological landscape that is settled in advance, especially in terms of infrastructure and the modes of engagement. If a new technical possibility proves problematic – as shown with marked links in the De Ridder study – then, hopefully, the intelligent consumer of CALL research will respond and be very cautious in their approach to Web-reading. However, given the ubiquitous nature of hyperlinks and reading on the World Wide Web, such research findings will need to be shouted out loud and clear to actually make a difference. Even then we will not stop students reading on the Web, but we can, as teachers, shape how it is used (see Garrett, 1998). This idea of shaping is important. It may lead to language teachers recommending a kind of reading that flies in the face of the predisposition to read in a particular way because of the inherent structure of the text. A linear, page-by-page presentation in a book predisposes the reader to engage with the text in a particular way. This is similar for the Web. But experienced readers can, of course, read linear books in non-linear ways as when one jumps to the summary at the end of the chapters in an academic text, or reads the conclusion first. Similarly on the Web one can 'read through' the links, but this needs experience and know-how. For now, research such as that by De Ridder is a crucial part of CALL's research agenda.

5.4 Generalising CALL research findings

This section concludes part five of this paper and is written very much with the 'consumer' of CALL research in mind (see Chapelle & Jamieson, 1990). I would like to consider some of the gaps in CALL research, as it is currently reported, that became apparent in constructing the CALL-1999 corpus. By attempting to fill these gaps, I believe CALL research will prove more useful and generally more widely disseminated and used, especially in helping to frame new CALL research studies.

The application of research findings more broadly involves some form of extension, from the particular to the general, on the part of the writer and the reader. Generalising in this way can be viewed in a narrower, technical sense, or in a broader, less rigorously defined way.

Beginning with the more technical definition, the term 'external validity' denotes the extent to which research results can be applied more widely, beyond the context of the original study. In other words, it measures the extent to which we can generalise from one study to another. Chapelle & Jamieson (1990) provide a valuable discussion in their chapter, ' Internal and external validity issues in research on CALL effectiveness'. To maximise external validity, Chapelle & Jamieson (1990: 49) say that the research report must clearly describe:

(1) the elements of the target language context,
(2) the characteristics of the subjects, and
(3) the CALL materials used.

According to Chapelle and Jamieson, this includes: (1) the nature of the learning

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environment, the method, behaviour/personality of the instructor, student objectives, time using CALL, whether CALL is optional or compulsory; (2) learners' goals, age, educational background, gender, motivation, cultural background; and (3) the precise nature of the CALL materials. In a CALL research study, each of these items requires careful and in-depth reporting, and, arguably, the more detail given the more the value for the researcher. In this we not only need to acknowledge the 'unique problems of L2 research' (1990: 38), but the unique problems of CALL research as well. This, in effect, means a further layer of reporting that needs to be provided in CALL research. Further aspects that typically need detailing are:

(1) CALL/course integration (if applicable)
    access, location issues
    informal/formal CALL balance
    teacher's/learner's role
    assessed/non-assessed
(2) levels of computer literacy by learner and by mode (using an appropriate scale)
    attitude and aptitude specifically with regard to computers/technology
    language-learning objectives
(3) modes of CALL use, carefully differentiated
    time allotted by mode

All these aspects are important for the reader when trying to judge the value of the research and level of generalisability of the findings. In many ways the more information about the context and the learners the better. In CALL research, items of particular importance are: the longevity of the research study because of novelty effects; the goals of learners, for the reasons stated above; and the kind of CALL that constitutes the focus, because in CMC-based CALL especially, characteristics vary so much by mode (see Harrington & Levy, 2001).

The final note concerns CALL artifacts. It is often surprising how little information is given on the availability of an artifact that has been described in a CALL article. Can the program be borrowed, bought, shared, or otherwise accessed somehow? Even if built only to the prototype stage, it can still be very useful to be able to try out the program with one's own students. When research findings relate to generic applications, email for example, the reader is likely to have access to the application, or one very similar to it, so this particular aspect is not as much of a problem. However, reports on CALL artifacts lose much of their potential value if they cannot be evaluated by others. Therefore, whenever possible, CALL artifacts should be shared or exchanged. In general, CALL researchers need to reach out to the reader/consumer of CALL research in writing up their research by providing as much detail as possible on the conditions surrounding the study.

6 Conclusion

This study illustrates that it is possible to detect clear patterns in the goals and directions of CALL research. No doubt there are other ways to classify and represent CALL research other than in the ways described here, and I am sure members of the CALL

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community will differ on the relative value of the various paths being pursued. Nonetheless, on the basis of the CALL-1999 study, there is evidence of a considerable degree of coherence in the directions that CALL researchers are taking.

Also, I hope I have made the case that CALL research is worthy of study as a body of work in its own right, not merely as an adjunct to research being undertaken in another, related field. CALL does have its own research agenda with legitimate and distinct problems that CALL researchers wish to address.

A distinct thread runs through much if not all CALL research. For the CALL researcher, technology always makes a difference; the technology is never transparent or inconsequential. This is at the heart of what differentiates CALL from other cognate disciplines. CALL researchers are sensitive to the differential effects that specific technologies can exert and they endeavour to understand them through research. At the very least, in CALL research, the particular technology in use is taken to affect the language produced, the learning and teaching strategies, the learner attitudes and the learning process. Beyond that, technology may affect the ultimate goals of learners, the nature of the learning environment, teacher education and what it means to be competent in a language. There are examples of all of these in the research component of the CALL-1999 corpus. I agree with Nina Garrett (1998) when she says, 'technology is going to define language teaching' (1998: 8) and 'we are the only ones who can control and shape technology use' (1998: 9). That is why CALL research is so important.

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Appendix A: Identifiers or 'candidate' descriptors

RESEARCH-NEW-DATA
Scope Notes: Research studies that present new 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 (see Krathwohl, 1993: 34). Articles or papers may or may not conform to the traditional convention for the presentation of new research (i.e. introduction, literature, method, results, discussion etc.). Original research findings and new data will be accompanied by discussion. 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.

Compatible: THEORY, DESIGN, EVALUATION
Not compatible: RATIONALE-TO-APPLICATION, RESEARCH-DISCUSS

ARTIFACT
Scope Notes: A specific CALL application, described in detail

It has usually been constructed by the author(s) of the article or close associates. ARTIFACT signifies 'CALL materials' (see Levy, 1997: 11) of some kind that have

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been created. This label includes 'named' CALL projects (e.g. 'Crescendo in Italia' — Brussino *et al*., 1999), specially constructed Web sites (e.g. Mugane, 1999), CALL programs (Johns & Lixun, 1999), CALL software (Mills, J., 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, e.g. CMC.

Compatible: DESIGN, EVALUATION, HYBRID
Not compatible: RATIONALE-TO-APPLICATION (assumed under ARTIFACT)

ENVIRONMENT-IT
Scope notes: CALL as a distinct form of instruction or method

Examples include 'multimedia environment' (Fleta *et al.*, 1999), 'network-supported learning environment' (Gu & Xu, 1999) and 'ICT Environment' (Dias, 1999). The descriptor is not used for wholly online learning environments though the label 'environment' may still be used (e.g. Lexica Online — Goodfellow *et al.*, 1999).

Compatible: ARTIFACT, CMC, DESIGN
Not compatible: HYBRID

Note: The term 'environment' needs further clarification. Candidate descriptors might be simply 'environment' for general usage, and 'environment-online' for Goodfellow *et al.* and similar examples.

HYBRID
Scope notes: CMC mode combinations, or CMC/artifact combinations

Such combinations include audioconferencing and email (Kötter *et al.*, 1999), or artifact/CMC combinations (Goodfellow *et al.*, 1999). This descriptor is also used for CD/Web combinations (e.g. Jeffery, 1999).

Compatible: ARTIFACT, CMC
Not compatible: ENVIRONMENT-IT

TECHNOLOGY
Scope notes: The technology itself as a major focus in the article (e.g. speech recognition — Wachowicz & Scott, 1999)

The discussion centres upon a specific technology rather than a specific artifact, though the artifact may be used as an example of the technology. An in-depth evaluation of the technology will usually be included.

Compatible: DESIGN, EVALUATION, ARTIFACT
Not compatible: PRACTICE

THEORY
Scope notes: The theoretical base of CALL learning environments, programs or activities described or discussed in detail (e.g. autonomy – Blin, F., 1999)

There is a specific reference to a theory or theories, especially as a framework or guide.

Compatible: RATIONALE-TO-APPLICATION, ARTIFACT, DESIGN
Not compatible: PRACTICE

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