Computer Assisted Language Learning

― Its History and Evaluation ―

コンピュータ支援言語学習

― その歴史と評価 ―

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Abstract：コンピュータ支援言語学習は，語学学習の新時代の到来だと考える者もいます。実際には，何十年も前から進化し続けてきました。本稿では，CALLの歴史とその課題，現在の方向性について検討します。さらに，教師がCALLシステムの有効性をどのように評価すべきかを検証します。

Keywords：CALL, CALL History, CALL Effectiveness, Language Acquisition, ICT, EFL, Technology, Computers, Computer Assisted Language Learning

Using modern technology in the foreign language instruction environment is has become commonplace. Its inclusion has moved beyond using computers for word drills, fill in the blank exercises, and making PowerPoint presentations. Foreign language instructors now use technology to accomplish all sorts of tasks in and out of the classroom. Teachers create social media-like environments in which students can interact and practice their target language; they use wiki-style projects to encourage student collaboration; and they use blogging software to encourage discourse. However, throwing technology into a curriculum does not necessarily make the instructor a better teacher nor the students better learners. A Computer Assisted Language Learning (CALL) system needs to properly serve the needs of the student and instructor in order to be considered truly successful.

Ⅰ. CALL History

Before we look at how to evaluate a CALL system, let us first look at the history of CALL.

The term CALL (computer-assisted language instruction) was used before CALL. This is a reflection of its originating as a subset of CAI (computer-assisted instruction). But CALI fell out of use among language teachers as it implied a teacher-centered approach to language instruction, while language teachers tend to prefer a student-centered approach, which focuses on learning rather than instruction. (Davies & Higgins 1982: p. 3)

According to Elizabeth Hanson-Smith, we find in Stephen Krashen's writings and research from the 1970s and '80s a strong focus on the experimental approaches that led TESOL into an era of communicative language learning. CALL as a field was at a crossroads – should students communicate with the computer (an ever patient and accessible teacher)? Or should the computer serve as a catalyst for communication between students? (Hanson-Smith, 2003)

The initial hope was that something like a sophisticated reflective listening system could be built. This system would ask for initial student input

and then begin asking reflective questions based on that input such as "Why?" or "What does that suggest to you?" This would create a somewhat realistic virtual dialogue that might fall into the Uncanny Valley. The generally accepted (if not often misunderstood) standard for artificial intelligence is still based on the Turing Test. When communicating with an AI system, can the user tell it isn't human? Since natural languages are massively more complex than programming languages, AI systems have yet to develop into passable conversation partners. (Ibid)

The arrangement of people around a computer playing games, using simulations, doing grammar drills, etc. was expected to foster human interaction coupled with the use of technology. Research from that time looked into whether or not language was really being taught through interaction with the computer, or was it being learned because students were learning in groups. (Ibid)

Moore's Law brought about more powerful processors; this lead to more powerful computers overall. With the arrival of more powerful computers, CALL could integrate the use of multimedia and interactivity into its programs. But there has been a consistent downside to ever improving computer technology: it has consistently struggled with "hand-me-down" syndrome; each technology innovation incorporated into CALL has come from other fields in computer. No dedicated research into CALL specific technology and programming has been done. (ibid)

Now that we have an understanding of how CALL technology has progressed, let us take a look at how CALL methodology has changed over time.

According to Warschauer and Healey, CALL went through three phases: Behavioristic, Communicative, and Integrative. (Warschauer and Healey, 1998) But these three stages of CALL development do not fall precisely into easily defined or demarcated timelines. As new stages emerged, previous stages continued to persist. (Bax, 2003)

CALL was born from the behavioristic tutorial-and-test approach – or "drill and learn" – method of language teaching popular in the 1940s and 1950s (Hanson-Smith, 2003). At its birth, CALL was limited in its abilities. Thus, the TESOL field replicated its own history through CALL – using repetition and drilling as a means to ingrain a new language into a student; very boring and not very adaptive.

This behavioristic stage consisted of stimulus/response style language learning. The learner, seated in front of a computer, was given something to respond to: a vocabulary word, a verb to conjugate, etc. The learner was expected to provide a correct response. Initially, this interaction could only take place via textual input and output. The computer would check the users' responses and give feedback. (Warschauer and Healey, 1998)

The technology of the time, mainframe computers, was too rigid and cumbersome to provide the kind of interaction we have come to understand is needed for language acquisition.

Behavioristic CALL relies on a Structural approach to language learning. The drills and practices reinforce a formal, structural view of language. It focuses on grammar and vocabulary exercises, and strict translating tasks. It emphasizes accuracy in reproducing language, but it has no place for any form of creative or original output from the learner.

Modern language instructors have mostly rejected this method of language instruction. However, this style of instruction can still be seen in some of the current CALL programs. The style itself is fine for self-paced drilling, but it lacks the interaction and sophistication needed to achieve a high level of learning.

The second stage of CALL's history is the communicative phase. This phase is based on the communicative approach to language learning. The communicative approach relies in implicit language learning – eschewing grammar and vocabulary drills

for the whole language approach. This method relies on students generating original target language output, and so too does a communicative CALL system.

Exercises in a communicative CALL system involve students using text reconstruction exercises, giving directions to various places on a map or using paced readings. These exercises give students a chance to create original, comprehensible output instead of the rigid, drill based output common with behavioral methods.

At the time of the Communicative CALL phase, personal computers were becoming ubiquitous. Not only were computers more common and easier to manage, they were more powerful. They had better input and output methods (keyboards, mice, displays, etc.).

Computers still played the role of language tutor, but they created a contextual environment in which students could use the language. These environments included games that were not initially designed for language learning, but facilitated it nonetheless.

This approach to CALL was eventually seen as a disjointed manner with which to teach language. Tools were coopted from other tasks to give students an arena in which to learn their target language. But ultimately, the computers were incidental to learning, not a planned, integral part of the language learning process. (Warschauer and Healey, 1998)

The final, modern stage of CALL, according to Warschauer and Healey is the Integrative Phase. This phase saw the computer move from tutor to integrated tool. The rise of this phase coincided with the mainstreaming of multimedia tools and the Internet.

With the rise of the Internet came blogs, wiki-style sites, online language learning sites, mobile apps to study target languages, and a nearly endless list of tools to use to facilitate and administrate language instruction.

In later publications, Warschauer changes the name of the first phase to Structural and revises the dates he feels each phase started as follows:

- Structural CALL: 1970s – 1980s
- Communicative CALL: 1980s to 1990s
- Integrative CALL: 2000 and onwards. (Warschauer 2000)

However, in *CALL – Past, Present, and Future*, Bax disagrees with this way of categorizing the phases of CALL's history, saying:

Throughout Warschauer's discourse these categories are considered 'phases', with rough dates attached. However, he also offers disclaimers as to the historical validity of these phases. For example:

"The three stages mentioned above do not fall

Table 1 *Warschauer's Three Stages of CALL History:*

Stage	1970s – 1980s: Structural CALL	1980s – 1990s: Communicative CALL	21st Century: Integrated CALL
Technology	Mainframe	PCs	Multimedia and Internet
English-teaching paradigm	Grammar-translation and audio-lingual	Communicative language teaching	Content-Based, ESP/ EAP
View of Language	Structural (a formal structural system)	Cognitive (a mentally constructed system)	Socio-cognitive (developed in social interaction)
Principal use of Computers	Drill and practice	Communicative exercises	Authentic discourse
Principal objective	Accuracy	And fluency	And agency

(Warschauer 2000)

into neatly contained timelines. As each new stage has emerged, previous stages continue. Current uses of computers in the language classroom correspond to all three of the paradigms mentioned above." (Warschauer and Healey, 1998)

This seems ambiguous—are they historical phases or are they not? If they are historical phases, how is it that all three coexist together today? And if they are not in fact closely related to historical periods, then it is surely unwise to speak of them as phases at all and to attach dates to them. In some places, furthermore, Warschauer speaks of these three categories as 'paradigms' or 'perspectives' (e.g. Warschauer) – which only adds to the conceptual confusion. (Bax, 2003)

Bax goes on to say that the first category, Behavioristic CALL, is the likeliest to garner agreement among language teachers while the other two are not very accurate. This is mostly because language teaching still operates under multiple paradigms, so saying that CALL has moved from say, Communicative to Content-Based, while Communicative teaching styles are still deeply entrenched in classrooms around the world, would mean that CALL has somehow surpassed the classrooms in which it is used. (ibid)

Bax asserts that these phases need further clarification because:

1. it is not clear whether the phases represent clearly defined historical periods or even whether they are supposed to;

2. the validity of the characterization of the 1980s as part of 'Communicative CALL' requires more support and tighter reference to mainstream CLT methodology if the term is to be acceptable, as well as clarification of whether we are evaluating aims or use of software or software itself, or some combination. It seems more satisfactory to rename that phase as it relates to that

historical period;

3. the rationale for identifying a third phase, and then calling it 'integrative', calls for more support- in terms of attitude to language and language teaching it has not been clearly enough distinguished from communicative approaches, while the implied claims for actual integration of CALL into the syllabus and classroom practice require more support and, as I shall argue below, are doubtful.

It would seem necessary, as a consequence, to formulate an alternative vision of the history of CALL, one whose terminology is less confusing, and whose categories seem to fit better with the historical progression of CALL software, approach and practice. In addition, it should allow us to see clearly where CALL stands at the moment and where it can usefully go in the future. This is a large undertaking, and cannot be completed here; however, it is possible to sketch out how such an alternative vision might be framed. (ibid)

Bax goes on to lay out a new series approaches (not phases as Warschauer and Healey created) to CALL. In Bax's words:

In my analysis I shall not refer to 'phases'— which implies a greater historical validity than is warranted—but to more general 'approaches'. I call the first approach 'Restricted CALL'. In terms of its historical period and its main features it differs little from Warschauer and Healey's 'Behaviorist CALL', as can be seen in Table 2, but the term 'Restricted' is more satisfactory since it allows us to refer not only to a supposed underlying theory of learning but also to the actual software and activity types in use at the time, to the teachers' role, to the feedback offered to students and to other dimensions—all were relatively 'restricted', but not all were 'behaviorist'. The term is more comprehensive, more flexible and therefore more satisfactory as a descriptor.

Table 2　Resticted, Open and Integrated CALL: an outline

Content	Type of task	Type of student activity	Type of feedback	Teacher roles	Teacher attitudes	Position in curriculum	Position in lesson	Physical position of computer
Restricted CALL Language system	Closed drills Quizzes	Text reconstruction Answering closed questions Minimal interaction with other students	Correct/incorrect	Monitor	Exaggerated fear and/ or awe	Not integrated into syllabus—optional extra Technology precedes syllabus and learner needs	Whole CALL lesson	Separate computer lab
Open CALL System and skills	Simulations Games CMC	Interacting with the computer Occasional interaction with other students	Focus of linguistic skills development Open, flexible	Monitor/ facilitator	Exaggerated fear and/or awe	Toy Not integrated into syllabus—optional extra Technology precedes syllabus and learner needs	Whole CALL lesson	Separate lab—perhaps devoted to languages
Integrated CALL Integrated language skills work Mixed skills and system	CMC WP e-mail	Frequent interaction with other students Some interaction with computer through the lesson	Interpreting, evaluating, commenting, stimulating thought	Facilitator Manager	Normal part of teaching—normalised	Tool for learning Normalised integrated into syllabus, adapted to learners' needs *Analysis of needs and context precedes decisions about technology*	Smaller part of every lesson	In every classroom, on every desk, in every bag
		Any, as appropriate to the immediate needs						

(Bax, 2003)

The key dimensions—theory of learning, software, activity types, teacher's role and so on—can all be seen in the first row of Table 2 . The ways in which Restricted CALL fits these dimensions can then be seen in row two—for example, it sees the teacher's role as being restricted to monitoring, the feedback restricted to closed responses and so on.

Row three shows the second approach, which I term 'Open CALL', since it is relatively open in all dimensions—from the feedback given to students, to the software types, to the role of the teacher. Arguably, it is not completely open, but at least its main characteristic in comparison with Restricted CALL is its relative openness in these dimensions.

The fourth row shows the characteristics of 'Integrated CALL' (not integrative, as in Warschauer and Healey's formulation). The key point about Integrated CALL—which sharply distinguishes it from Warschauer and Healey's—is that it does not yet exist to any significant degree, but represents instead an aim towards which we should be working. I shall argue later that at this moment in the historical development of CALL we are still operating within the second approach, Open CALL, our aim being to move towards Integrated CALL in future. (ibid)

One might ask then whether these are historical phases at all. Bax's raises this question and answers it himself, saying:

In general, my three approaches do coincide with general historical periods – Restricted CALL dominated from the 1960s until about 1980; Open CALL has lasted from the 1980s until today, with some Restricted CALL manifestations still observable and still valuable in their place (e.g. in grammar revision and checking). Integrated CALL exists in a few places and a few dimensions only, but is far from common, as I shall argue below. It is therefore possible to use this analysis as a guide to broad historical developments in CALL.

However, this classificatory framework also offers a number of other benefits when contrasted with previous analyses:

1. The terminology prevents conceptual confusion with behaviorist or communicative approaches to learning or teaching

2. The classification is, I suggest, more accurate as a description of what happened in the past and is happening now.

3. The framework allows us to define our

practice in some detail. For example, we might find that an institution is Restricted in some aspects, Open in others and Integrated in others, giving a clear idea as to its practice in all key domains of CALL practice. (ibid)

Bax's new approach to classifying the history of CALL goes a long way towards addressing the overlap we see in different time frames. It also helps us understand how it is that different stage of development in CALL can exist at the same time. Instead of looking at where CALL is in general, we can look at a particular language institution and label where they are at, even refining it to different aspect of their own programs.

Ⅱ. Where is CALL Now?

Having looked at the various approaches to categorizing the history of CALL, it makes sense to look at where CALL is now. In the case of Open CALL, we can see that beginning in the 1980s there was a slowly growing understanding that previous approaches had been restricted, and that new approaches and methodologies were needed. In this vein, attitudes about computer-assisted learning were more open and were clearly growing more humanistic. This was usually due to technological limitations related to hardware and software making it impossible to use computers for realistic communication in a Communicative Language Teaching environment. Upon the arrival of effective Computer Mediated Communication tools – such as the web, email, etc. (and the ubiquity of their availability) – CALL began to grow in both its overall usage and ability.

But nowadays, it is entirely possible to use computers for genuine communication. There fore it would make sense to say that a more "genuine" role for CALL developed from the mid 1990s on – at least as far as software is concerned. However, much software being produced today is still relatively entrenched in the Restricted paradigm. It can be said that we are general in an Open phase of CALL,

but that individual institutions and classrooms may also methods that are Restricted or Integrated. As far as truly integrating Computer Assisted Language Learning within the broader realm of language teaching and learning, that is a goal whose achievement is still a long ways off, but on which we should remain focused nonetheless. (Bax, 2003)

Evaluating The Effectiveness Of A CALL System

Now that we have an understanding of CALL's technological and methodological evolution, let us look at how one can best evaluate the effectiveness of a CALL system.

According to Uschi Felix, one needs to take several points into consideration when evaluating a CALL system's effectiveness. First one needs to determine what metrics should be used to determine the effectiveness of the CALL system in place. Next, one needs to consider how to conduct the evaluation of the CALL system. Finally, one needs to consider how to fix any problems found during the evaluation (Felix, pp. 12–17).

Before carrying this discussion any further, it should be pointed out that the purpose of this review is to cover summative evaluation, not formative evaluation. Formative evaluation takes place when initially setting up a CALL system or introducing new materials. Summative evaluation is used to measure the effectiveness of an existing CALL system. (Levy & Stockwell, 2006, p. 42).

First, one needs to determine which aspects of the CALL system will be evaluated. Not surprisingly, the metrics involved will vary from environment to environment. The evaluator must take into consideration the end goal of the evaluation process. To reach this point, the authors suggest considering certain criterion:

1. Will you be evaluating the need for new technology to be added to your existing system? If so, what do you feel the system in its current state is lacking and how do you hope to resolve this (Ma & Kelly, pp. 28–29)?

2. Will you be evaluating students' usage of the CALL system? Do you want to evaluate if the CALL system is improving target language acquisition? Do you want to focus on which aspects of the CALL system are being used by students and which are under utilized or ignored (Hegelheimer & Tower, p. 191)?

3. Will you be evaluating user and instructor perception of the CALL system? Do you want more information on how they view and use the system? Do you want to know if they feel that the system is working for them (Timuçin, p. 264)?

Next, one must determine which method to use to gather information on the CALL system. Levy and Stockwell explain that there are generally two methods one can use for the evaluation process: checklists and surveys. Surveys and checklists are most commonly used by the teacher-designer turned teacher-designer-evaluator – that is, people who teach, create the CALL materials themselves and have charged themselves with evaluating and maintaining the CALL system. Those who are not instructor – evaluators or those evaluating an system already in place that they were not initially involved with would do well to initiate a formative evaluation in conjunction with a summative evaluation (Levy & Stockwell, p. 44).

When checklists are used, the aspects of the CALL system being evaluated should be clearly defined, the methods and criteria used to effectively answer the questions should be clear and unambiguous, and guidelines should be given regarding how to address the short comings in the CALL system. (Levy & Stockwell, p. 44).

In regards to survey usage, Stockwell and Levy give a table that relates the specific intent of the evaluation to authors who covered surveys for those intents. The original can be found in *CALL Dimensions* on p. 45. I recreate the table here for the sake of ease of reference:

Once the subject of the evaluation is determined and the data gathering evaluation is finished, one must determine how to fix any problems found in the system. Again, as the subject of what needs to be evaluated will differ from system to system, so too will what needs to be fixed. Some common problems that arise are covered here.

If the evaluation reveals that too few of the functions of the CALL system are being used, but the overall system itself is universally accepted by its users, Hegelheimer and Tower suggest that the instructor should take class time to point out the underutilized features. When doing this, the instructor should not only point out their existence, but should explain how they are used and how they will benefit the user (Hegelheimer & Tower, pp. 196–200).

If it turns out that there is reluctance among the

Goal or Purpose of the Evaluation	Author(s)
To evaluate a new technology, functionality or application (e.g. automated speech recognition, mobile technologies)	Harless et al. (1999); Holland, Kaplan and Sabol (1999); Thorton and Houser (2002)
To assess student attitudes and perceptions regarding CALL programs, CDs, Web sites, Web-based projects, etc).	Giemno-Sanz (2002); Hémand and Cushion (2001); Trinder (2003)
To obtain feedback from students and / or tutors on a CALL course (web based) or courseware	Iskold (2003), soboleva and Tronenko (2002)
To investigate learners' views on the feedback features of a distance-learning teacher-training course (e.g., technical and design features, relevance, possible pedagogical implications, method of delivery)	Ypsilandis (2002)

students and / or users to adopting the system, then these concerns should be addressed. Chambers and Bax state that, often, students may feel that they paid for classroom instruction but are being turned over to computers instead. A balance of lab time for computerized drills and classroom time for face-to-face communications; lectures and conversation practice should be maintained (Chambers and Bax, p. 472).

Chambers and Bax go on to say that a common occurrence among instructors is the fear that computers will replace their jobs. In these instances, it is important to point out to the instructors that the computers are there to ease their workload, not to replace them outright, as no computer has approached the level of Artificial Intelligence needed to replicate human speech (Chambers and Bax, p. 472).

One further thing to point out to both instructor and student is that a CALL system can provide something that human instructors can't: a consistent answer to basic questions. Ma and Kelly explain that CALL systems often provide a help feature that allows the user to query a particular word, grammatical construct, etc within an exercise. That feature will, in turn provide a preprogrammed response – and obviously this response won't change from usage to usage as a human may be prone to do when asked the same question repeatedly. Of course, the consistency of the answer is offset by the shallow level of help this feature can provide (Ma & Kelly, p. 19).

Technology is a powerful tool, but as is often said, it is still in its infancy. As far as we have gone with CALL, there are still huge leaps in progress to be made. So, while maintaining a CALL system, it is important to make sure you are keeping pace with advances, that the users are happy and that the desired results are being achieved.

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