FOREIGN LANGUAGE TUTORING SYSTEMS TODAY: OLD-FASHIONED TEACHING WITH NEWFANGLED GADGETS

Alessandro Micarelli* and Patrick Boylan**

*Author of Section 4
Dipartimento di Discipline Scientifiche - Sez. Informatica
Universita' di Roma III
Via della Vasca Navale, 84
00146 Roma, Italy
E-mail: micarel@inf.uniroma3.it

**Author of Sections 1,2,3,5
Dipartimento di Linguistica
Universita' di Roma III
Via del Castro Pretorio, 20
00185 Roma, Italy
E-mail: b o y l a n @ u n i r o m a 3 . i t

Abstract

Researchers and practitioners in the field of language instruction largely agree today that proficiency in a foreign language requires more than grammatical competence: it requires a kind of know-how they call "communicative competence", of which grammatical competence is but a subset. The present paper claims that, although this view of language learning has been prominent for over a generation (Hymes seminal paper "On communicative competence" dates back to 1966), it has had little impact on Computer Assisted Language Learning (CALL) projects. Indeed, CALL systems regularly use the most recent and technologically advanced hardware/software resources to implement the most out- dated grammar-based pedagogy; thus, the total instructional value of such systems is undercut by the very didactics they (often quite ingeniously) embody. In the present paper, a case is made for "Conversational Rebuilding", a recent trend in "communicative teaching" that has been implemented in a text-based CALL system built around a Common LISP Artificial Intelligence engine on a MacIntosh platform. It is argued that a system of this kind is likely to give more instructional value than systems using more sophisticated interfaces or architectures but which embody more traditional language teaching methods.

1. Introduction

The field of Computer Assisted Language Learning (CALL) is clearly multidisciplinary; it touches questions lying at the intersection of

* COGNITIVE and SOCIAL PSYCHOLOGY:
What does it mean to "know" something? How can we "measure" knowledge?
What creates positive/negative attitudes toward learning a foreign language and its culture?

* COMPUTER SCIENCE:
How can domain knowledge be represented computationally?
What algorithms capture the interaction between a skilled human teacher and a student?

* DESCRIPTIVE LINGUISTICS / SEMANTICS
What is the phonological, lexical, morphological, syntactic, pragmatic and cultural system of the language to be taught?
How are (conceptual) meanings expressed using these resources?

as well as the sister disciplines of descriptive linguistics:

* SOCIOLINGUISTICS / PRAGMATICS / ETHNOLINGUISTICS:
How do people actually communicate in various contexts (rules of use versus rules of usage)?
How do people get things done with words (what makes speech effective)?
How can speakers with different backgrounds convey and grasp culturally-determined meanings?

* APPLIED LINGUISTICS:
What does learning a language entail (from learner to learner)?
How may language learning be facilitated in a given context (e.g., in a class, alone before a screen, in real-life situations)?

The fact that CALL embraces a wide variety of disciplines requires (in theory) that CALL system designers have extremely broad intellectual interests and be highly diversified readers. In practice, however, most CALL researchers -- even teams of researchers -- seem to concentrate their attention on pet disciplines, giving the others short shrift. Applied linguistics and sociolinguistics/pragmatics, the sister disciplines of descriptive linguistics, usually end up in the Cinderella role, and this explains the poor educational quality of most of the computationally sophisticated CALL systems produced so far (Kenning & Kenning 1983:143, Boylan 1995a:93). Even when these systems are tested for their instructional value, the wrong criteria are used and thus their real ineffectiveness goes unperceived: "...all the studies of the effectiveness of CALL assess effectiveness in terms of short-term mastery of discrete point, disconnected, and usually relatively trivial items of language, precisely the kind of testing [and teaching -- eds.] that modern language pedagogy tries to avoid" (Garrett 1991).

The stimulating volume on Intelligent Tutoring Systems (ITS's) edited by Swartz & Yazdani (1992) is indicative of the this tendency. Of the twenty ITS's described in the volume, fifteen

foster language learning that is discrete-point as opposed to holistic and either rote or rule-oriented as opposed to intentional and ad hoc (locally-situated):

   * five systems foster learning lexis as such (MacWhinney, Miller & Feldbaum, Swartz, Handke et al., Psotka et al.);

   * ten systems teach grammatical items (DemaiziŠre, Fum et al., Abeill,, Frederiksen et al., Chanier et al., Tasso et al., Cerri et al., Kempen, GᴶVenir, Zock);

   * while only five systems aim at promoting communicative language learning, i.e. learning that is holistic, intentional, and situated: Legenhausen & Wolff (story writing with STORYBOARD), Hamburger & Hashim (getting animated figures to obey one's orders), Sussex (obtaining appropriate help from the system), Wilks & Farwell (dialoguing with stick people, writing letters), and Criswell et al. (contextualizing reading passages).

Thus, while CALL researchers have worked hard, over the past generation, at keeping abreast of the endless waves of new computer technology and the latest findings of the cognitive sciences, most do not seem to have noticed the quiet revolution in learning theory that has swept through foreign language classrooms. The grammar/translation exercise books that most of them remember from school days are no longer to be found in the better classrooms. The purely normative view of linguistic competence that teachers once professed, after first ceding to the dictates of structuralism in the sixties, has been largely replaced by a communicative-cultural criterion, better able to prepare language students to fit into a globalized tertiary economy. This new criterion holds that "language is as language does" and, therefore, that any sentence a student utters is right IF IT WORKS (if it obtains the intended effect). Inversely, if a sentence doesn't work, it is wrong -- no matter how grammatically well-formed and impeccably pronounced it is. (This of course presupposes that students have the opportunity of using the foreign language they are learning in real or simulated intercultural situations where they are trying to get something done, not in the traditional classroom setting where speaking is limited to answering the teacher's questions or doing gratuitous exercises with a classmate. For a convincing ethnographic justification of the communicative criterion, see Frake 1982; and Brumfit & Johnson 1979; for a reflection on how to define instructional value in empirical terms, in particular when dealing with communicative methods, see Canale 1983; for the role of culture in language instruction, see Byram 1994).

Failure to appreciate the full impact of the communicative-cultural revolution probably explains -- in part -- why so many CALL projects ingeniously (and ingenuously) harness cutting-edge technology to implement didactically out-dated practices. The next section, therefore, will briefly describe the new way of viewing language and language learning that the Cinderella disciplines of sociolinguistics/pragmatics/ethnolinguistics and applied linguistics made popular in the seventies, giving academic credibility to the communicative-cultural criterion. Section 3 will examine a few of the conversationally-oriented CALL systems described in the literature to see how well, if at all, they stack up against the communicative-cultural criterion. Then, Section 4 will present a typical communicative-cultural approach to language learning -- specifically, a classroom teaching procedure called Conversation Rebuilding -- and show how its CALL implementation overcomes some of the educational shortcomings of the language learning support systems described previously. The concluding section suggests that, to avoid the anomaly

of using advanced technology to replicate old-fashioned teaching practices, CALL research in general might benefit from following the top-down approach we have adopted in our present research endeavor: we first asked what it means in today's world to "know" a foreign language; we then scouted around schoolrooms searching for educational practices consonant with that view; we then -- and only then -- turned to the cognitive and computer sciences to see what tools and models they offered to formalize computationally the practices we chose as instructionally most valid; finally, we chose the most promising of those practices that, given the limits of present-day technology, could readily be replicated on a school-budget CALL system -- Conversation Rebuilding.

2. New Ideas in Language Learning

The seventies saw the eclipse of the "audio-lingual method" (ALM), an outgrowth of "structure drill courses" such as those developed by the U.S. Army during and after World War II to get servicemen speaking at least the fundamentals of the language of the country they were to be sent to. While genuine ALM courses were not all rote (they included contextualized dialogues and role play), students still spent most of their time repeating decontextualized model sentences to be transformed according to a cue. In the more superficial ALM courses, that is all they did.

It is easy to criticize ALM: its structuralist/behaviorist underpinnings simplistically view language learning as pure "habit formation" in manipulating patterns. It therefore grossly underutilizes the student's intelligence and creativity: audio- lingual drills (requiring students to recall and apply patterns just heard) play on short term memory and associative capacity and on little more. Still, the method enjoyed considerable success among avant-garde teachers in the sixties because, whatever its limits, it worked. It got students -- at least the more motivated ones -- to SPEAK a foreign language fluently (albeit mechanically), something the old-fashioned grammar/translation method it replaced had never even attempted to do. Besides, ALM enjoyed the academic respectability of the then-dominant behaviorist school of psychology. (Skinner's "Verbal Behavior" appeared in 1957. Although Chomsky reviewed Skinner's book critically from a cognitive standpoint as early as 1959, his article was initially sloughed off by the language teaching community.)

It was not until a new and different student population, beginning with the baby boomers, made itself felt in the late sixties and early seventies that the teaching community suddenly realized times had changed: students were potential international businessmen, not soldiers to be stationed abroad, and as such demanded to be treated as thinking beings who spoke to convey felt meanings, not simply to perform verbal gymnastics. ALM was out. Cognitive principles became popular. Piaget's theory of the two-way process of assimilation and accommodation took on credence (see, for example, the widely-read Dakin 1973). So, too, did S. Pit Corder's arguments for considering learners' non- standard utterances as hypotheses rather than thoughtless blunders (Corder 1967/1981). Teachers began to see the progress of their students as a progressively developing system which mirrored some internalized syllabus (see, for example, Nemser 1971, Selinker 1972). As the emphasis moved from langue to parole in Saussurian terms (Saussure 1922), teachers began to see that it was the situation, not the words, that communicated (Sudnow 1972); audio-visual aids and more richly illustrated textbooks made it easier to bring the outside world into the classroom and create simulations to contextualize speech.

By the end of the seventies, the use of texts designed to illustrate grammatical principles had begun to give way to the use of so-called "authentic materials", i.e. acts of communication -- films, ads, conversations (surreptitiously recorded) -- produced BY native speakers FOR native speakers to pursue locally recognizable aims: to persuade, entertain, provoke or whatever (Wilkins 1976). Teachers began to see that the meaning of words in the simplest conversation went far beyond what could be determined mechanically by consulting a dictionary: meaning is largely ad hoc, a creative link between sound and situation. And the more teachers became interested in meaning as locally determined, the more they saw that it is people, not words, that mean things -- people in society, of which words in texts are but a pale reflection. Put another way, teachers saw that language is fundamentally a form of concerted social action (Austin 1962) embracing a view of life (or Weltanschauung -- Mannheim 1974 [1952]) and therefore that learning a different language is fundamentally LEARNING FROM A NEW COMMUNITY to ACT/REACT differently in order to REPRESENT/GRASP life differently -- sometimes in ways quite "alien" to one's previously acquired habits. In the same way, using a different language is fundamentally WANTING TO MEAN something slightly (or even radically) different from what one would have meant to say if one were using one's native language, and to MAKE MEANING of things differently, too. In conclusion, with the arrival of the eighties and nineties, communicative teaching (Brumfit & Johnson 1979) and its most recent development, cultural-communicative teaching (Boylan 1992), could finally claim to have come of age`.

3. Computer Assisted Language Learning

Unfortunately, Computer Assisted Language Learning cannot. Even when sophisticated Artificial Intelligence (AI) techniques are used, the actual learning most CALL systems foster is of the grammar/translation or audio-lingual (structural) kind, as illustrated above (see also Imlah & du Boulay 1985, Barchan et al. 1986, Yazdani 1991, Kibby & Heller 1994).

But what if a CALL system were to take inspiration from the communicative revolution and treat language (parole), not as an accumulation of "sentences", but as "a flux of intentionality exteriorized in utterances, intelligible only as part of the situated event which provoked it"? This is admittedly a tortuous definition; but it states why a CALL system focusing on language as parole must necessarily provide students with practice in such abilities as: (1) using intonation both grammatically and to reveal intent, structuring extemporaneous speech by means of discourse markers, connectives, and discourse-cohesion devices (Coulthard 1977); (2) projecting a self-image coherent with one's aims, managing turn-taking, alternating registers and co-determining goals (Bygate 1987); (3) grasping meanings as intentional states, perceiving the cultural determination of intentionality and thus coping with communication as an on-going culturally-determined meaning-making event (Boylan 1995b). These abilities are seldom, if ever, taught when teaching focuses on a language as a rational system (*langue*).

Thus, while *langue*-oriented CALL systems (and traditional language teachers) seem to suppose that people learn a language simply to be able to MAKE CORRECT STATEMENTS in it to foreigners, a CALL system based on communicative principles assumes that people learn a new language in order to be able to DO THINGS with it: to be able to JOKE or to ARGUE or to NEGOTIATE SUCCESSFULLY in it, even to SWEAR or to FLATTER or to BADGER in it (in

culturally acceptable ways). Such a system would therefore be designed so as to give students the chance to WANT TO GET SOMETHING ACROSS to a real or simulated interlocutor. This is not to say that students would not also learn how to MAKE CORRECT STATEMENTS; but such a secondary ability would simply be the by- product of more meaningful communicative activities, an ability students would learn along the way, not as a preliminary. (The communicative approach in fact has made it possible to teach the sophisticated verbal activities just listed, and others, even to beginner students of a foreign language -- see for example the hallmark first-year communicative courses in English as a second language "Starting Strategies" by Abbs & Freebairn 1977 and "Kernel One" by O'Neill 1979.)

Finally, while most CALL systems treat all non-standard utterances as "mistakes" to be eliminated without a second thought, a CALL system based on communicative principles would be designed to consider qualifying deviant utterances as creative attempts at imitating the foreign language's consistencies (evidence of an interlingua), and use that hypothesis in guiding the student's subsequent learning (Richards 1974). Oddly enough, heuristics based on the constructive use of student "errors" are found in Intelligent Tutoring Systems (ITS's) designed to teach programming languages (Miller 1982, McCalla 1994) much more frequently than in ITS's designed to teach human languages (Swartz & Yazdani 1992).

Let us now look at a few descriptions -- taken from the literature -- of CALL systems purporting to teach languages communicatively, to see how well they stack up against the criteria just proposed.

1

In their paper "Applying Features of Purposeful Conversation to an Intelligent Tutoring System for Children's Acquisition of a Second Language", Button, Oatley & Draper (1989) describe a CALL system which is claimed to be based on communicative principles ("purposeful conversation" says it all). Indeed, the authors begin by proclaiming principles with which we could hardly agree more: (1) even when engaged in smalltalk, people speak with a purpose, as philosophers of language like Austin (1962) and Searle (1969) have long pointed out; (2) goals, like other aspects of meaning, are negotiated during a conversational exchange. The CALL system that the authors have actually produced, however, does not live up to the principles set forth. Here, taken from their paper, is a sample exchange between a learner and their CALL system:

COMPUTER: Mary.
LEARNER: Yes.
COMPUTER: I want to suggest a goal.
LEARNER: Go ahead.
COMPUTER: Will you help me bake a cake?
LEARNER: By all means.
COMPUTER: Shall we make a plan?
LEARNER: Okay.
COMPUTER: I suggest we mix the ingredients and then you put the cake in the oven.
LEARNER: All right.

This is not the scenario of a conversation if the term "conversation" implies, as it should, negotiation of discourse goals: there are no trade-offs here. Rather, this is the scenario of what language teachers call an "Open Dialogue": a set exercise with constrained responses (generally expressing assent) and a pre-determined thematic flow, cleverly arranged to give the student the illusion of conversing. Open Dialogue exercises, which abound in printed form in the better foreign language textbooks, are of course a positive step forward, if compared to old-fashioned "fill in the blank" grammar exercises. And to be honest, they come close to what we have managed to produce so far with the CALL system to be illustrated in Section 4. Still, they are not conversation: there is only minimal spontaneous intentionality on the part of the student and very little dynamic co-determination of discourse goals.

The transcription continues:

COMPUTER: Shall we make a plan?
LEARNER: Okay.
COMPUTER: I suggest you mix the ingredients.
LEARNER: All right.
(...)
LEARNER: I want to tell you something.
COMPUTER: Go ahead.
LEARNER: I have made the cake.
COMPUTER: I see.
LEARNER: Let's assess the result of my action..

The authors claim that LEARNER represents a child (a very exceptional child if s/he spontaneously uses expressions like "assess the result"!) and that the exchange represents "adequately natural" conversation. This second affirmation is highly debatable. "Adequate" for what? The authors do not specify. "Natural" in what sense? The dialogue has none of the discourse features listed above. (Although they characterize primarily speech, they show up in spontaneous writing as well, especially if interactive as on a computer: see Crystal & Davy 1975, Levinson 1983, Brown & Yule 1983.) In conclusion, it would appear that Button et al. have produced a CALL system which teaches (stilted) man-machine dialogue, not natural conversation of the kind a language student must master in order to work effectively in an international company or organization.

2

Yamamoto et al. (1991) describe a CALL system which gives the learner more opportunity to shape the flow of conversation. Their system uses a "goal-oriented discourse model"; we take this to mean that the system (rightly) aims at getting students to produce, not just grammatically well-formed sentences, but fluxes of intentionality framed linguistically in ways coherent with their aims. To see whether this be the case, let us examine an excerpt of the sample conversation furnished by the authors.

C = hotel Clerk (CALL system), T = Traveler (student)

01. C: May I help you?

02. T: I want a room.
03. C: Do you have a reservation?
04. T: Yes.
05. C: May I have your name?
06. T: My name is John Tenniel.
07. C: Just moment, please.
08. I'm sorry, I can't find your name.
09. T: Check my name again.
10. C: May I have your name again?
11. T: My name is John Tenniel.
12. C: Yes, here it is. Mr Tenniel, we have a reservation for a
13. twin for tonight for you. Is that right ?
14. T: Yes.
15. C: A twin is $110. OK?
16. T: It are too expensive.　　　　　　[*** It is... ***]

Up to this point the system has made only one correction: it has proposed to change "ARE" to "IS" (presumably to respect concord in Standard English). This gives the student the impression that the rest of the exchange constitutes satisfactory conversation. It does not. While descriptive linguistics would find nothing objectionable in the student's verbal production (except for the already mentioned lack of concord in "IT ARE"), from the standpoint of sociolinguistics/pragmatics/ethnolinguistics every one of the student's utterances may be considered objectionable. That is to say, every sentence produces an unintended effect and must therefore be considered "wrong".

Sentence 2 is an imperious demand and thus, without an attenuating intonation, could appear slightly insulting to most British and American speakers. The same goes for the bluntness of the imperative in 9. Equally blunt is the "yes" in 4 and 14, not followed by a short answer auxiliary or filler. (Again, proper intonation could make the monosyllabic reply acceptable; but Yamamoto's CALL system makes no provision for adding intonation to the reply typed in -- for example, by choosing from a palette of intonational curves.) The repetition of "my name" in 6 and 11 is awkward and sounds scholastic. The same holds for the choice of the pronoun "it" instead of the deitic "that" in 16: the lack of explicit reference to the situation, typical of conversational English, makes the speaker seem distant.

Thus, Yamamoto's CALL system ends up (in the case just examined) by giving the student practice in talking like a finicky, arrogant foreigner. Presumably this is not the effect the student would want to make in real life, when dealing with Brits or Americans.

We may conclude that, in a CALL system based on detecting and correcting student "errors", rules of usage must be applied along with rules of grammar. Indeed, as Hymes (1972 [1966]) reminds us, "Without rules of use [usage], the rules of grammar would be meaningless": in other words, instruction based solely on grammar is quite literally nonsense. Of course, we can always go ahead anyway and, oblivious to the usages of a foreign culture, attempt to produce meaningful utterances using only the grammar of that culture's language; our utterances, however, may end up being meaningful in ways we did not intend. This is what causes the faux pas that people with only a "scholastic" knowledge of a foreign language tend to commit.

A more recent CALL system is described in McCoy et al. (1996): it teaches deaf people (users of the American Sign Language) to write in English. The system creates and works with a User Model, i.e. an explicit representation of the linguistic choices a particular user makes during a session with the system, in particular her/his grammatical "errors". The CALL system we will present in Section 4 also uses a User Model: a representation of the student's choices is compared to the representations of Typical Cases of Misunderstanding (pre-confectioned with the help of an expert teacher), stored in a database in the computer's memory; this permits the system to decide which remedial course of action to take. In the CALL system described in McCoy et al., a standard grammar of English has been augmented with a set of "typical error production" rules (mal-rules); this expanded grammar allows the parser to deal flexibly with variations of standard syntax, instead of simply rejecting unforeseen divergences as incomprehensible; this permits giving students specific remedial advice whatever they write.

The system is far from perfect, however. The creation and update of the user model cannot deal with non-monotonicity in student reasoning. Moreover, it does not take into consideration the semantic contents expressed by the user's utterances. In addition, as with Button et al. and Yamamoto et al., the system does not consider the discourse features which a user must master to write effectively and which, in any case, the CALL system must know how to recognize before interpreting the sense of a syntactic feature or deciding on its grammaticality. But the principal objection to this CALL system comes from Applied Linguistics: the system perpetuates the traditional student-teacher relationship, in which students focus on writing "correct" statements for an interlocutor-judge (a traditional teacher, a normative CALL Tutor), not on trying to externalize fluxes of intentionality in ways readily understood by readers interested in their ideas (e.g., a pen pal, a communicative CALL Tutor). Users of the CALL system described by McCoy et al., therefore, are likely to become more proficient in avoiding grammatical errors than in making themselves fully understood. Still, the theorization and implementation of a User Model is a decidedly positive contribution: it makes man-machine interaction more effective and paves the way for expanding the Model, by incorporating discourse features, in successive versions.

4. A CALL system based on Conversation Rebuilding

Conversation Rebuilding (CR) is primarily a teacher-led classroom activity, in which students are conducted, slowly and purposefully, through the same selection process that native speakers perform instantaneously and subconsciously in conversing. The CR technique (as reported in Aiello et al. 1991; Micarelli & Humphris 1991) may be described as follows:

1) The teacher begins with a target utterance in mind: if the students are viewing a film, it can be the response that one character is about to give another character at the point in which the teacher stops the film; if the students are about to listen to a recorded humorous dialogue, it can be the tag line and the lines immediately preceding it. The teacher directs the attention of the class to all relevant extralinguistic (contextual) information available to the speakers, through a combination of mime, pictures and language.

2) The teacher invites the class to impersonate the character who is about to speak and to guess what, given the context, that character may WANT to say: any utterance, however ungrammatical, can constitute a suitable starting point for CR.

3) The first student to speak is asked to repeat the utterance s/he hypothesizes so that everyone can hear it. This marks the beginning of the learning process: the attention of the class is focused on the relationship between psychological intent and linguistic form.

4) The teacher mentally compares the student's hypothesis with what the character in the film or anecdote is actually about to say. The task now is to get the whole class to modify the utterance hypothesized, one trait at a time, until it conforms to what the character actually says (in the case of "orthodox" CR) or, if the teacher decides to give free rein to the students, could conceivably say ("flexible" CR). Rapidly deciding which trait to deal with first, the teacher comments on the hypothesis in such a way as to lead the students to modify it. This, for example, is how a teacher might prompt correction during a CR session in a typical "English as a Second Language" class. STUDENT: "That's intelligenter." TEACHER: "Huh?" Or, if a more explicit prompt were required: "Huh?...More what?" Or if a still more explicit prompt were required: "'Intelligenter'?...Ah, you mean 'smarter', huh?...Or 'more intelligent'?" (To which he student may reply "Yes, smarter", "Yes, more intelligent" or simply "Yes", meaning "You got the idea", and go on.) The degree of explicitness called for in prompting a student is set by the User Model that good teachers automatically constitute in their minds for each of their students.

6) The teacher compares the students' revised hypothesis with the target utterance and again decides which divergent trait is the most appropriate to deal with. Priority is assigned according to a (generally unconscious) algorithm that teachers devise on the basis of experience (one that can, however, be formalized explicitly in an AI-based CALL system). The procedure is repeated until the students' final utterance conforms with (or functions as well as) the target utterance. The CR process goes more quickly as the dialogue proceeds, since students key into the aims of the speakers. It remains, however, a psychologically demanding, time-consuming activity that teachers are wise to limit to 45 minutes, one lesson out of five.

The CALL implementation of Conversation Rebuilding that we are about to describe is quite similar to the "orthodox" classroom version (in which the target-sentence remains invariable). Imagining that they are a character in an anecdote presented on the computer screen, students try to second guess the character's lines by typing the utterances they hypothesize into a screen window; the system, acting as a Tutor, challenges their utterances if they diverge from the original, selecting items to call into question, one by one, on the basis of an algorithm assigning priority, devised with the help of an expert teacher. (In general, the system focuses on the lexical, syntactic, semantic and pragmatic aspects that are the most misleading, conceptually divergent, anacoluthic or culturally unauthentic in that order). This forces the students to alter their utterances item by item until they sound like something a native speaker might say -- and in fact does say, in the person of the character in the original anecdote, whose line then appears on the screen.

Let us now examine dialogues produced by two CALL systems using Conversation Rebuilding. The first of the two dialogues was produced on a fully working prototype of a text-based CR program built around a Common LISP Artificial Intelligence engine on a MacIntosh platform, as

described in Aiello & Micarelli (1993). The second dialogue shows what our second prototype system, under development, will hopefully produce; the dialogue has been artificially reconstructed from the system specifications. (The second system, derived from the first, will feature a multimedia interface with video, graphics, and hypertext; it will permit "semi-flexible" CR and will incorporate routines to handle the discourse features listed earlier. In addition, the Tutor in the second system will use everyday expressions instead of speaking "classroom-ese" as does the Tutor in the first system.)

Both systems have a serious limitation from the standpoint of information science: they enable students to rebuild only a selected number of conversation scenarios, specifically the scenarios built into the system. The semantic networks used by the systems are scenario-specific, i.e. constructed by hand to cope with all foreseeable student replies for the semantic contents of a specific conversation. This limitation does not turn out to be a defect from the standpoint of the instructional value of the system: it is indifferent to the student whether the ITS is hard-wired for the scenario s/he is working on, or capable of handling any other scenario as well. Moreover, from the standpoint of CALL research, hard-wiring has permitted us to experiment with a finalized version of computerized CR, something that would have been far out of our reach had we felt obliged, for example, to come up with semantic nets capable of handling any scenario. This shortcut has, in turn, permitted us to gather precious information on what CR can and cannot do for students and how it should be implemented. We might compare our prototype to the ones created in a "demo language" by software houses before getting down to writing the final program in a full-blown language.

Here, then, is a sample dialogue, with the parts in Italian (advice, encouragement) translated. We chose to have the Tutor counsel the students in their native tongue, Italian, to guarantee understanding and to maximize impact.

The Flower Shop Anecdote

Context: A Londoner, Peter, is thinking of his mother who is on vacation in Italy. It's her birthday. He sees a flower shop that is just opening and goes inside.

Clerk's Intent: Serve the client; make a sale.

Peter's Intent: Send flowers to mother.

Target 1: Good morning. Can I help you?
Target 2: Good morning; I want to send some flowers to my mother in Italy.

_____

CONVERSATION 1:   "Semi-flexible" CR on Prototype II

_____

Tutor: Now, I'm Peter and you're the clerk. You want to help me. OK?
Student: OK.

Tutor: Well, say something.
Student: Good morning.
Tutor: Good morning. ...[pause]... Well, offer me help!
Student: May I help you?
Tutor: "May"? Don't be so formal.
Student: Can I help you?
Tutor: OK -- here's what the clerk says in the conversation.

        (...)

Tutor: Now you're Peter and I'm the clerk. Good morning.
Student: Good morning.
Tutor: Can I help you?
Student: I wants to buy any flowers.
Tutor: "Any"? Is this a question?
Student: Some flowers.
Tutor: What do you mean? Say something more.
Student: Some flowers, please.
Tutor: Who are they for?
Student: for my mother.
Tutor: Peter says "send".
Student: I wants to send some flowers for my mother.
Tutor: "For"?
Student: to my mother.
Tutor: "I wants" sounds terrible.
Student: I like to sound terrible.
Tutor: Could you ask your question again? And tell me where
 your mother is.
Student: I wants to send some flowers to my mother in Italy.
Tutor: Ok -- here's what Peter says in the conversation.

Here is the same interaction on the first system we built; the
Tutor uses "classroom-ese".

_____

CONVERSATION 2:   "Orthodox" CR on Prototype I
_____

System: What does the clerk say to Peter?
Student: What do you need?
System: "You" is not the right agent, and "need" is only similar to the predicate I was expecting.
Student: Could I help you?
System: Could is conditional. I was expecting a present. Please try again.
Student: Can I help you?
System: That's right. Now, what does Peter answer the clerk?
Student: What flowers have you?

System: Please pay attention. They are talking about sending something. Please try again.
Student: I want to send flowers to my mother in Rome.
System: Try some flowers instead of flowers.
Student: I want to send some flowers to my mother in Rome.
System: Rome is not the right place. Have a look at the extralinguistic information.
Student: I want to send some flowers to my mother in Italy.
System: That's right.

Admittedly, neither of the two man-machine dialogues can be called natural conversation: our LISP algorithm governing the Tutor is, as of present, able to handle only the Invariable Answer variety of Conversation Rebuilding; the addition of aleatory routines in our "Semi-flexible" system under development (see CONVERSATION 1) is basically a cosmetic operation. Moreover, since the Advice Production rules depend on the parser, they are essentially grammatical in nature and thus sound very much like the normative language of traditional teachers. The Tutor in Prototype II, by using everyday words instead of grammatical terminology (see CONVERSATION 1), will try to seem like a peer; but the the normative substance of the Tutor's remarks will remain. In spite of the difficulties, however, an algorithm capable of handling the full potentiality of CR in its most flexible form, i.e. as "linguistic experimentation and discovery", remains our goal. And, strangely enough, even in its present form, our working system gives many students the impression of a Tutor that seeks to understand them and strives to help them express themselves, not an inflexible school marm teaching rules.

But the real point is another. The "authentic conversation" that our System permits students to practice is not -- and was never claimed to be -- the dialogue with the Tutor that leads up to the composition of the target utterance, but rather the composition of the target utterance itself. That utterance, taken from authentic materials (a film, a radio sketch) has almost all the characteristics of natural conversation: reconstructing it permits students to interiorize natural speech in English. In other words, as the students reconstruct the conversation between the characters of an anecdote or scenario, they associate felt intentionality (in varying degrees, according to how much they accept to playact) with one possible authentic linguistic realization of that intentionality (the actual line in the anecdote or scenario). In addition, composing the target utterance gives the students practice in re-shaping their self- image in a fashion acceptable to the target-language culture, something the other CALL systems do not even attempt to do.

But why -- one might object -- go to the bother of creating an AI engine-based CALL system if all the students do is interiorize a pre-confectioned conversation? Why not simply have students memorize lines from a foreign language play to be put on in class?

Participating in a foreign language theater production is, in fact, a good method for learning authentic speech in that language; but our CALL system gives students much more. For one thing, it gives them the possibility of co-managing (or feeling they are co-managing) the total flow of discourse, something they must be able to in life (e.g., when conducting a business meeting). They do not receive preparation in this ability when they consciously follow a script (or, for that matter, when they are interrogated by a teacher/computer in traditional teacher-led instruction). As in test-flying a simulator instead of a real airplane, it makes little difference whether students are really in charge of the conversational flow; it is enough that they feel they

are in charge for the activity to be educational -- and students who have used out system claim they had that feeling. Moreover, the discovery technique -- which is certainly enhanced by implementation on an ever-patient computer -- assures that students take notice of and MEAN TO SAY every linguistic feature in the final utterances they compose. (When, instead, students memorize a part in a play, they often say their lines like little children reciting a prayer or singing the national anthem, unaware of the full sense of the words they use.) Finally, the discovery technique is much more enjoyable than learning by heart a typical textbook scenario for dramatization in class, countlessly repeating the lines until they stick.

Thus, whatever its computational limits, our system may be considered -- from the standpoint of its total instructional value and the user satisfaction it generates -- a real step forward from the early days of CALL, in which communication skills were equated with crossword puzzle skills.

As for the computational side of our working CALL system, the Tutor is piloted by an algorithm for generating advice capable of deciding the optimal path the Tutor should take in addressing the student's divergent sentences, item by item. The algorithm offers tutorial advice in the form of questions, requests, and information provided to the student, which may be described as operators intended to help the student reduce the difference between her/his current hypothesis and the target utterance. Such an algorithm can be defined in terms of "means-ends analysis" operators, i.e. the search technique used in GPS (Newell and Simon 1963).

In order for such an algorithm to operate it is crucial to have a module that computes the distance between the sentence and the target, expressed in "differences" of varying kinds. Lexical and syntactic differences are obtained by consulting a grammar detector and corrector (presently the dictionary contains about 3600 lexical items). During the syntactic analysis the identification of the grammatical forms is performed, the derivation tree of the student sentence (possibly) generated, and any deviant forms detected. These deviances will be used to determine the syntactic differences between the student sentence and the target.

The parser, based on the chart formalism (Satta & Stock 1994), is constituted by 124 grammar rules; it deals with a wide range of sentences (declarative, interrogative and imperative) and is described in some detail in Aiello, De Sanctis & Micarelli (1993). During semantic analysis the consistency between the semantic contents of the student's sentence and the contents of the target utterance is verified. To this end the system uses both an internal representation of the extralinguistic information and a representation of the system expectations which constitute, in substance, the content of the single target sentences. The frame formalism has been used for representing the relevant knowledge.

5. Concluding Remarks

Traditional foreign language teaching usually views students as generators of isolated utterances, each one immediately labeled as "correct" or "incorrect" by an omniscient and implacable Tutor. The communicative revolution of the seventies, on the other hand, characterized by methods like Conversation Rebuilding, taught language teachers to view communication as a collaborative relationship: the sense of a particular utterance and the acceptability of a particular linguistic

construction are something which the parties involved negotiate to some extent within a situated context. (This also holds among native speakers when when they create or use slang.) Communicative methods such as CR see language acquisition as an evolutionary process: students acquire "kinds" of English or French or Russian, each "kind" constituting an "intermediary version" of the target language, with its own internal consistencies which an intelligent Tutor can ferret out and play upon. This does not mean that a method such as CR does not aim for speech that is authentic (and thus sufficiently correct as well) in the target language. It does -- much more so than methods teaching a language as a rational system. But it aims first and foremost at inducing students to WANT to EXPRESS THEMSELVES AUTHENTICALLY, the key to language acquisition (Boylan 1992).

 The CR technique in particular has another advantage: it is easily implemented. Although teachers practicing CR (and conversationalists in general) use sophisticated interpretive abilities to guide the flow of conversation, their interpretations may (to some extent) be simply viewed as intelligent pattern matching, the assignment of meaning to utterances on the basis of instances of similar constructions stored in memory, taking into consideration the history of the interaction up to that point. When teachers (acting as Intelligent Pattern Matchers) encounter an utterance that "jars" linguistically or sense-wise, they make a stab at a possible meaning and check it out, calling into question whatever "jars". This prods their student interlocutor into spontaneously eliminating the discrepancies from her/his utterance, in order to make it "clear" (and thus "authentic", "sufficiently correct"). The burden of MAKING MEANING is therefore on the student, not on the teacher. It is obvious how this lightens the task of programming a CALL Tutor. What is less obvious is that it permits a more satisfying kind of man-machine interaction, since it makes the student an intelligent protagonist.

Our experience in applying CR to a CALL system points to a conclusion that should be evident but that, given the situation described in Section 1, turns out to be decidedly non-trivial. In looking for ways to harness the latest hardware/software technology to help students learn languages, researchers should begin by deciding what kind of knowledge students should have of foreign languages and cultures today. They should then investigate what the better teachers are doing in classrooms around the world and select those activities which are (a) conducive to acquiring the kind of knowledge deemed important, (b) intrinsically self-correcting or, if not, correctable by an external agent using the simplest possible heuristics. As we just affirmed, a CALL system does not have to act intelligently to be didactically effective; it only has to get the student to act intelligently. Exercises that are intrinsically self- correcting are not only easier to implement, they are also educationally superior to ones requiring the intervention of a highly intelligent agent: as they train a student in a given discipline, they train her/him to be an autonomous learner in life.

If, instead, researchers begin by toying with the latest hardware/software tools, they risk falling prey to the all-too-human tendency to privilege the search for means over the definition of ends. In the case of CALL, not having adequately called into question what it means to "know" and to "learn" a foreign language today, researchers run the risk of taking out-dated ideas and making them seem new thanks to glamorous information-age packaging; they thereby contribute to perpetuating the unsatisfactory kind of teaching that created the need for CALL in the first place.

###

Acknowledgments

Bibliography

Abbs, B. & Freebairn, I. (1977), *Starting Strategies*, London: Longman.

Aiello, L., De Sanctis, A. & Micarelli, A. (1993), "Computer Assisted Language Learning: A Grammar Detector and Corrector", in: *Proceedings of the Seventh International PEG Conference*, Edinburgh, Scotland, p. 19-28.

Aiello, L. & Micarelli, A. (1993), "A System for Foreign Language Learning based on Conversation Rebuilding", in: *Proceedings of the World Conference on Artificial Intelligence in Education AI-ED 93*, Edinburgh, Scotland, p. 314-321.

Austin, J.L. (1962), *How to do things with words*, Oxford: Clarendon Press.

Barchan, J., Woodmansee, B.J. & Yazdani, M. (1986), "A PROLOG- based Tool for French Grammar Analysis", *Instructional Science,* Vol. 14, p. 21-48.

Boylan, P. (1992), "La lingua straniera", in: Tullio De Mauro et al., *L'alfabetizzazione culturale e communicativa*, Firenze: Giunti Marzocco, p. 71-157.

Boylan, P. (1995a), "What does it mean to 'learn a language' in today's world; what role can present-day computer technology play?", in: *Proceedings of the Symposium on Language and Technology,* Florence: Editrice CUSL, p. 92-114.

Boylan, P. (1995b), "Logos e Polis", Tuesday Conferences, Center for Semiotics, Palazzo Caramanico al Chiatamone, Naples, Feb. 7, 1995, mimeograph.

Brown, G. & Yule, G. (1983), *Discourse Analysis*, Cambridge: University Press.

Brumfit, C.J. & Johnson, K. (eds.) (1979), *The Communicative Approach to Language Teaching,* Oxford: Oxford University Press.

Button, C.G., Oatley, K. & Draper, W. (1989), "Applying Features of Purposeful Conversation to an Intelligent Tutoring System for Children's Acquisition of a Second Language", in: *Cognitive Systems* 2-3, p. 261-273.

Bygate, M. (1987), *Speaking*, Oxford: Oxford University Press.

Byram, M.l & Morgan C. (1994), *Teaching and learning language and culture*, Clevedon: Multilingual Matters.

Canale, M. (1983), "From communicative competence to communicative language pedagogy", in: J.C. RIchards & R.W. Schmidt, *Language and Communication*, London: Longman.

Chomsky, N. (1959), "Review of Verbal Behaviour by Skinner, B.F.", in *Language* 35. Reprinted with a further comment by Chomsky in: L.A. Jakobovits & M.S. Miron (eds.), *Readings in the Psychology of Language*, Englewood Cliffs (N.J.), Prentice- Hall, 1967.

Corder, S. Pit (1967), "The significance of learners' errors", in *IRAL* 5.}#`þ}

Corder, S. Pit (1981), *Error Analysis and Interlanguage*, Oxford: Oxford University Press.

Coulthard, M. (1977), *An Introduction to Discourse Analysis*, London: Longman.

Crystal, D. & Davy, D. (1975), *Advanced Conversational English*, London: Longman.

Dakin, J. (1973), *The Language Laboratory and Language Learning*, London: Longman.

Chanier, T. (ed.) (1994), "Special Issue on Language Learning", *Journal of Artificial Intelligence in Education*, 5(4).

Frake, C.O. (1962), "How to ask for a drink in Subanun", *American Anthropologist*, 66(2): 127-132.

Garrett, N. (1991), "Language Pedagogy and Effective Technology Use", *Applied Language Learning,* 2, p. 1-14.

Greer, J.E. & McCalla, G.I. (eds.) (1994), *Student Modelling: the Key to Individualized Knowledge-Based Instruction,* Berlin: Springer Verlag.

Hymes, D. (1972 [1966]), "On communicative competence", in: J.B. Pride & J. Holmes (eds.), *Sociolinguistics: Selected Readings*, Harmondsworth: Penguin Books. [Paper, Conference on Language Development among Disadvantaged Children, Yeshiva University, 1966].

Imlah, W. & du Boulay, B. (1985), "Robust Natural Language Parsing in Computer Assisted Language Instruction", *System*, 13, p. 136-147.

Kenning, M.J. & Kenning, M.-M. (1983), *An Introduction to Computer Assisted Language Teaching*, Oxford: Oxford University Press.

Kibby, M.R. & Heller, R.S. (eds.) (1994), "Special Issue on Emancipation Through Learning Technology", in: *Computers & Education*, London: Pergamon Press.

Levinson, S.C. (1983), *Pragmatics*, Cambridge: Cambridge University Press.

Mannheim, K. (1974 [1952]), "L'interpretazione del concetto di 'Weltanschauung'", in: id., *Sociologia della Conoscenza*, Bari: Dedalo [*Essays on the Sociology of Knowledge*, London, 1952].

Miller, M.L. (1982), "A Structured Planning and Debugging Environment for Elementary Programming", in: D. Sleeman & J.S. Brown, *Intelligent Tutoring Systems*, New York: Academic Press (An early attempt at adapting to the logic of user behavior.)

McCoy, K.F., Pennington, C.A. & Suri, L.Z. (1996), "English Error Correction: A Syntactic User Model Based on Principled Mal-Rule scoring", in: *Proceedings of the Fifth International Conference on User Modeling* UM-96, Kailua Kona, Hawaii, pp. 59-66.

Micarelli, A. & Humphris, C. (1991), "An Artificial Intelligence Approach to Natural Language Tutoring", *Cognitive Systems*, 3(1), p. 69-78.

Nemser, W. (1971), "Approximative systems of foreign language learners", in *IRAL* 9.

O'Neill, R. (1979), Kernel One, London: Longman.

Richards, J.C. (ed.) (1974), *Error Analysis: Perspectives on Second Language Acquisition*, London: Longman.

Searle, J.R. (1969), *Speech Acts: An Essay in the Philosophy of Language*, Cambridge: Cambridge University Press.

Selinker, L. (1972), "Interlanguage", in *IRAL* 10.

Skinner, B.F. (1957), *Verbal Behavior*, New York: Appleton-Century-Crofts.

Satta, G. & Stock, O. (1994), "Bidirectional context-free grammar parsing for natural language processing", in: *Artificial Intelligence*, 69(1/2), p. 123-164.

Saussure, F. de (1922), *Cours de linguistique générale*, Paris: Payot.

Stevick, E.W. (1976), *Memory, Meaning & Method*, Rowley (Massachusetts): Newbury House.

    "   (1980), *Teaching Languages: a Way and Ways*, Rowley (Massachusetts): Newbury House.

Sudnow, D. (1972), *Studies in social interaction*, New York: The Free Press.

Swartz, M.L. & Yazdani, M. (eds.) (1992), *Intelligent Tutoring Systems for Foreign Language Learning,* Nato ASI Series F, 80, Berlin/Heidelberg: Springer Verlag.

Widdowson, H.G. (1978), *Teaching Language as Communication,* Oxford: Oxford University Press.

Wilkins, D.A. (1976), *Notational Syllabuses,* Oxford: Oxford University Press.

Yamamoto, H., Kai, K., Osato, M., Shiino, T. & Inui M. (1991), "A Structure of an Intelligent CAI System for Training Conversation of a Foreign Language Based on Conversation Simulation", in: Lewis R. & Otsuki S. (eds.), *Advanced Research on Computers in Education*, Amsterdam: Elsevier Science Publishers B.V. p. 249-254.

Yazdani, M. (1991), "The Linger Project - An Artificial Intelligence Approach to Second Language Tutoring", *CALL*, 4 (2), p. 107-116.