

# I-CALL and Second Language Acquisition (SLA)

## *Contents*

- 1) Teacher participation in I-CALL Development**
- 2) Common assumptions about technology and language learning**
  - a. Interactivity
  - b. Adaptation to individual preferences
  - c. Learner-centeredness
  - d. The value of help and feedback
  - e. Authenticity
- 3) Pedagogical and theoretical issues**
  - a. Current bases for CALL and ICALL
  - b. Separating meaning from language
  - c. Making SLA like first language acquisition
  - d. Theories of language, language processing and language acquisition:  
the need for a new synthesis for ICALL

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The topic which I like to present to you this afternoon deals with so-called “intelligent” language tutor-systems. Therefore we will have to check out the terms intelligent on one hand and language-tutor system on the other.

First of all it's the text which all of you have read I suppose:

**I-CALL and second language acquisition** by Nina Garrett. At the moment, she's a director at the Centre for Language Study at Yale University in New Haven/Connecticut. The text we have read was written in 1995, 6 years ago then. In Computer Science it is quite important to know that because things are changing very fast.

### Teacher participation in I-CALL Development

In the beginning of her paper, she's investigating a very important issue, namely the *participation of teachers* in the process of computer-assisted language learning-systems. Language teachers have been little involved in the development of the systems for the most part what is quite astonishing I think. Why that? She says that foreign languages is a problematic field that for complicated reasons has not till now been very open to innovation in the teaching of language itself. That is because most departments of foreign languages consider themselves to be *departments of literature* and they regard only *literary theory* as being of intellectual importance to the discipline. Language teaching is still seen as the service end of the field and most language teachers are still trained primarily in *methodology*, not in linguistics or even applied linguistics.

## Common assumptions about technology and Language Learning

### **Adaptation to individual preferences**

The individualization of instruction, that is the individualization of the *learning process*, is one of the most important advantages claimed for CALL generally and for I-CALL from a more specific point of view. This is possible when the students work independently for their own purposes and at their own pace. It should be considered that learners vary widely in their learning styles and strategies, that is their aptitude, motivation, personality or whatever. This is quite an important advantage of technology: it has the *potential to adapt itself and the material it delivers*.

But in this context Miss Garrett raises a important question: it is not known whether accommodating individual learner preferences actually helps them learn language better or whether they would sometimes do better if they were taught to use strategies that do not come naturally. The first thing to point out is that there exists *two types of learners*:

1. Some people seem to learn best by throwing themselves into a learning activity. They have little anxiety about being wrong or uncertain, a high level of interactivity provides them with a useful wealth of input data.
2. Some people seem to learn better when they have the opportunity to reflect before they speak or respond.

But can one really say that cautious learners will learn better if they are pushed to abandon their individual proclivities (Neigung)? There's no evidence for that.

One the one hand I-CALL should fulfil the promise of individualization but one should not make *a priori decisions* about which styles or strategies are to be favoured because most learners do not of themselves develop the most productive strategies.

## **Learner-Centeredness**

The issue of learner-centeredness is closely related to the idea of individualization. In contrast, in a teacher-centered classroom the teacher controls all language interactions; almost all dialogue is between the teacher and one student at a time. In a learner-centered classroom the students talk to each other as much as to the teacher and they have a fair degree of autonomy in participating in classroom activities. With ***teacher-centered material design*** everything the student does is scripted and anticipated by the teacher in the person of the lesson designer. In ***learner-centered materials*** the student can make many more choices about what to work on.

Intelligent language-acquisition systems vary along the learner-centeredness perspective which is entirely appropriate as Nina Garrett states.

But it may be premature to assume that a high degree of learner-centeredness necessarily benefits language learning. If learners themselves do not understand their own styles and strategies you're not doing them good by turning over control of the learning activities to them.

## **The value of help and feedback**

ICALL's most salient feature is the ability to generate ***highly specific feedback*** whether in form of error analysis or of responses to learner initiatives. By now it's not very much known about the extent to which help and feedback actually contribute to the language development of the average learner. There is evidence that many, perhaps even most, learners ignore the availability of ***help materials*** even in tasks where it can be seen clearly that they need them. Furthermore it's not known when learners actually do use them whether that use results in learning (that means in change of their knowledge state) or whether it merely helps them over a momentary difficulty.

Therefore one of the best known aspects in I-CALL is the development of sophisticated *parsers* and the effort to tailor their output to provide *linguistically precise feedback of grammatical structure* for the benefit of learners.

### Pedagogical and theoretical Issues

Nina Garrett points out that approaches to language teaching and learning can be grouped into two broad categories:

- a) those whose primary emphasis is on language as an *linguistic system* and
- b) those whose primary emphasis is on language *communicative behaviour*.

This difference exists also in non-technology based approaches to language teaching. She states these two positions have become more extreme and have hardened into dogma. So the difference has become the basis for a dangerous polarization of the field.

### Current Bases for CALL and I-CALL

The theory produced in the 1970s and the 1980s is basis for most language material development today. This position held the following important points:

1. Organizing language around a *grammatical syllabus of instruction* is counterproductive.
2. Language is learned better when learners concentrate on the *meaning being expressed* rather than on the formal properties.
3. Second language learning is very similar to first language learning.
4. Learner's native language has very little effect on the development of the second language.
5. It's not much point in trying to teach structure because there is a natural order to the acquisition of structure.

Out of these points two major assumptions arise:

### 1. SEPARATING MEANING FROM GRAMMAR

Much of the theoretical work mentioned above was undertaken as a reaction against the grammar translation method of language teaching which did not produce fluent speakers of the languages studied. There seems to be a misunderstanding about the term *communicative competence (cc)*. In its original sense it certainly include grammatical competence but nowadays it is widely understood in language pedagogy to mean the *ability to communicate*. One could argue that it's possible to teach for *cc* without teaching grammar and many in foreign language pedagogy argue that the teaching of grammar has never had much effect on the learning of *cc* and therefore there is neither theoretical nor practical reason to teach grammar. Others continue to insist that we must teach grammar if there will be any hope that learners will ever express themselves grammatically.

Nina Garrett states that there is an ongoing debate on this issue that seems to be unresolvable. It has been said that in the grammar translation method we taught for grammatical *cc* and assumed that the ability to speak and understand language would more or less automatically develop; at least for motivated students. Nowadays she states we teach *directly for the ability to communicate* and assume that grammaticality will develop more or less automatically, at least for motivated students. And there she makes an interesting point:

She thinks that it's not possible to do a little of each (as she says: the so-called *eclectic approach*) and then think the two will come together satisfactorily.

One need to give the students a principled understanding of the relationship between communication and grammar. Methods training is full of mandates to language teachers about how they should focus on meaning not on form as if it were possible to separate them!

Second Language Acquisition (SLA) means developing the ability

*to connect meaning to form*

in a second language.

→ Efforts in ICALL must not simply adopt either a pro- or anti-grammar position but must take the lead in showing how grammar can be understood and presented in different ways from old approaches that do not any good.

## 2. MAKING SLA LIKE FIRST LANGUAGE ACQUISITION

Several authors asserts that SL-Learning by others should be structured to be as much as possible like non-classroom first language learning by very young children. This is not possible. It's obvious that adult learners simply cannot set aside their adult cognitive processing and ignore all that they know about language and language use. The influences of their schooling need to be considered too. It's recognizable that the learning process is enormously variable. Individual learners vary even more in the learning styles and strategies they employ in classroom than they did as babies. So Nina Garrett claims that the development of ICALL systems for SLA should not be shaped to resemble the FLA closely.

**Theories of language, language processing and language acquisition: the need for a new synthesis for ICALL**

In an next part of the paper Nina Garrett comes back to the distinction between language as *linguistic system* and language as a *communicative behaviour*. And there she states that the choice of goal dictates the choice of method. But it has to be understood that identification of a goal is not a theory of how the goal is to be reached. The most important basis for theories of language and theories of language acquisition is a theory of *language processing*. It has to be understood how people associate meaning with linguistic form, and how the association is *stored, retrieved* and *deployed* in communication that means how language knowledge is organised and used by the mind.

*Processing is primary* she states and the nature of language systems must be understood relative to it.

Former study of processability and learnability does not address the actual activities of processing and learning of real communicative language in real time by real people. It addresses only the logical problem of language processing and acquisition. So N.G. pleads that we should move our efforts into direction of *psycholinguistics* rather than on a linguistic or sociolinguistic theory. Then she contrasts the language-as-system and the language-as-communicative-behaviour concerning the kind of feedback each provides to the learners. Systems based on grammar parsing return detailed specifications of the linguistic problem whereas the language-as-communicative behaviour systems return a message about some logical problem with the communicative act.

But each of the systems can give learners only partial understanding of their production or comprehension but *no insight of what thinking underlies that surface*. Parsing for instance is basically an analysis of language form, that means what the error is, not an analysis of language processing, that means, why the learner made the error. No matter what one's theory of language is: *describing an error is not the same as explaining why the learner made it*. Neither linguistic feedback nor communicative feedback can provide the kind of psycholinguistic information the learner should have, information about how meaning and form are connected. I-CALL certainly needs to develop ways of recognizing what level of feedback a learner error requires. When is it an error of form, when is it an error of meaning?



At the end of the paper Miss Garrett is thinking about the partnership between teacher and technology. The advantage of the computer is the ability to record, tabulate and organize data on the learning history of individual learners that goes beyond the human beings' and it can diagnose individual learner problems more accurately than even the most attentive teacher. But there are language learning activities that absolutely require direct interaction with the teacher and always will, spontaneous oral communication for instance.

The organization and supervision, the whole process of language learning will always require extensive teacher involvement ***and although computers will not replace teachers, teachers who use computers well will replace those who do not.***

# ALICE-chan

*ALICE-chan (Ac) is a language training environment for Japanese that uses NLP as a basis both for assisting instructors in preparing exercises and for evaluating student responses.*

That's why I-CALL systems must be able to respond to input noisier than that used by other NLP programs. ALICE's approach to language teaching was that it is a process that involves a combination of exposure, explanation, and practice. In NLP applications, a parser analyses a sentence **according to the lexical items and rules provided in the Target Language (TL) grammar.**

## **Project Goals and Design Principles**

The primary function of ALICE is to be a **tool for research** in SLA. Four design principles underly ALICE:

1. Teachers and students who use the system should not have to know about linguistics or NLP.
2. ALICE does provide various resources and they can be put together into different environments:
  - a. It includes **Japanese text editing**
  - b. an **authoring interface** for exercise creation
  - c. an extended on-line **dictionary**
  - d. a **student interface** for exercise execution
3. Students and authors should be protected from having to learn programming language. Interactions are supported by graphical user interface.

## **Exercises**

In one of ALICE' exercises students must answer a question about a list of historical events. The students answer must contain a positive or negative sentence using the adverb **mo** or the adverb **mada**.

Student's answer in the box (A), has made two errors

ALICE can deliver many exercises like the type shown here, each exercise can be implemented as MC, fill-in-the-blank or full sentence response.

### **Exercise Authoring**

The first step in authoring an exercise is to enter text into the ALICE text editor. The text of the exercise should contain the background information to the question and the correct answer to question number 1. Next step is to identify the words and sentences that will be blanked out for students to fill in. In this figure here the answer for question 1 has been selected for blanking out. The system sends the identified words and sentences to the NLP programs. The NLP programs analyze the selected material and display the analysis as a **feature structure** at the bottom of the screen (which can be see here).

The feature structure represents the words in the Japanese sentence, their meaning in English gloss, the grammatical features such as tense or aspect.

***The feature structure is stored as part of the exercise and compared to a feature structure of the student's answers during error detection.***

→ That's why the matching of feature structures proves to be more flexible than matching the sentences themselves because feature structure abstracts away from the surface form of the sentence. ALICE can therefore accept sentences that have the same grammatical features and semantical roles ***even if they use a different word order or different but equivalent inflectional marking***. This increases the range of student's responses that can be accepted as correct in order to allow for natural variation in the wording of the sentences.

An NLP system is designed to accept any combination of **romaji** (Roman characters) and Japanese characters as input and can return a mixture of Japanese and English in its output.

There is a **lexicon** which contains information that allows the system to recognize words in all of their morphological variance and to identify syntactic and semantic feature of each word.

Each lexical entry consists of two main parts:

1. A list of **keys**
2. and a list of **syntactic** and **semantic features**.

The keys indicate possible orthographical realizations of a word. The second part of a lexical entry contains a list of feature-value pairs (S stands for “sense”). Its value is a short English gloss containing the meaning of the word. The feature M is a **romaji** spelling of the citation form of the morpheme.

Morphological analysis of Japanese is complicated by the fact that there are **no spaces between words** in written Japanese. Correct morphological analysis depends on correct segmentation that means dividing the sentence into different words. Morphological analysis is guided by the special features L and R.

Processes involved are highly complex and not objective of this presentation.

In addition there is another **analysis of syntactic structure**. The goal of syntactic analysis is to identify the predicate of each clause, the predicate’s syntactic and morphological features and a grammatical function for every other element of the clause. There are three stages:

1. Parsing
2. Mapping
3. Matching

FOLIE Figure 5.8 “Analysis of Student Input”

To come to an end of this study the question arises what the **advantages** and **disadvantages** of ALICE-chan are:

→ Advantages for authors include automation of exercise creation and feedback. The students offers better explanation of errors and more chances for communication. However NLP offers also many potential **pitfalls**:

For instance concerning automation of authoring: there is a high-level of automation achieved. The author only needs to type one correct answer for each exercise item. The NLP system analyses that sentence for structure, grammatical relations and morphological features and stores the analysis as a **feature structure** as I said before.

That structure characterizes a **class of correct answers having similar features**. Unfortunately, full automation is not possible for all sentence types because of the problem of **ambiguity**. Sentences may have multiple meanings, that must be represented by different feature structures. When the NLP programs do not have enough information to resolve the ambiguity they must resort to interactive disambiguation dialogs which requires a bit of extra work from the author. Another problem is dealing with error detection and feedback. The authors do not claim that ALICE-chan's feedback is pedagogical optimal. It contains many technical terms which may be slightly confusing. But ALICE can find the location of errors and can explain them in terms of linguistic relations.

Ambiguity is one of the most pervasive problems in NLP. Humans resolve ambiguity naturally using background knowledge to determine the interpretations that are appropriate in particular contexts. One solution to ambiguity can be the interaction with the user. ALICE provides a disambiguator, that is, a dialog which asks the user if it has detected ambiguities. Another possible disadvantage of NLP is that they take longer to develop than simple CALL systems because of the complexity of NLP programs and the size of grammars and lexicons. On the other hand NLP-based systems are quite portable due to the separation of data and programs. The ALICE parser for example does not contain any specific knowledge of Japanese, instead, the parser only knows how to apply rules to sentences. If it is given Japanese rules, it will apply

Japanese rules, if it is given Spanish rules, it will apply Spanish rules. The same parser can therefore be used for any language.

The authors of ALICE plan to extend the NLP coverage in the near future to several new languages including Korean, Spanish, German and English.

## Focus on Grammar

*The older CALL systems and also most of the newer, commercial CALL systems rely on simple techniques such as multiple choice questions where the input by students is severely limited.*

Typical CALL activities today make heavy use of the computer's capabilities of storing large amounts of data, e.g. written language, but increasingly now also spoken language and pictures or video. In this way, students can get ample input of the foreign language. In order to check their progress and provide an opportunity for language production, however, some output is necessary as well. This normally takes the form of answers to multiple choice questions or fill in the blank texts with a highly constrained choice of words or phrases. The grammatical transformation of sentences or short answers to given questions are a further type of output students can be asked to produce. All of this kind of language output is relatively easy to check, using simple pattern-matching techniques, but cannot be called creative or very close to real life situations outside school. It does, however, have the advantage that feedback by the machine can be produced very fast, but unfortunately the informational content of feedback which can be achieved with such a technique is extremely limited. Such feedback is necessarily binary, either right or wrong, and can only be varied on a stylistic level.

# Error-specific and individualised feedback (The German Tutor)

*This paper treats error-specific and individualised feedback in a web-based language tutoring system.*

Immediate and individualised learner feedback has long recognised as a significant advantage of CALL over more traditional language instruction. Sophisticated error analysis is crucial for a meaningful SL environment. A number of studies in the recent years have investigated **metalinguistic feedback vs. traditional feedback** in different CALL environments. It was found that NLP-based intelligent feedback which explains the source of an error is more effective than traditional feedback. Several studies found that metalinguistic feedback is very effective to adult second language learners. This paper here focuses on learner-computer interaction during the error correction process.

In particular, **learners' responses to metalinguistic feedback from an ILTS are examined.**

In this study, answers to the following three questions are pursued:

1. Do students read and attend to **metalinguistic feedback** or overlook it?
2. What techniques do students apply in **error correction** in an ILTS?
3. Do learners **believe the systems' analysis**, or, in the event of an error perform an independent re-analysis?

## **The German Tutor (GT)**

The GT is an ILTS that forms the grammar component of a web-based introductory course for German. It contains a **grammar** and a **parser** which analyses sentences from the student and detects grammatical and other errors. The goal of the *German Tutor* is to provide meaningful and interactive vocabulary and grammar practice for learners of German.

In the GT students can choose from a variety of different **exercise types** (dictation, form sentences and so on).



**The pedagogical goal behind an ILTS is to provide error-specific feedback.** For example, if a student chooses an incorrect article in German the error might be due to incorrect inflection for gender, number, or case.

Meaningful tasks and interactivity require intelligence on the part of the computer program. The *German Tutor* emulates two significant aspects of a student-teacher interaction:

1. **it provides error-specific feedback** and
2. it allows for **individualization** of the learning process

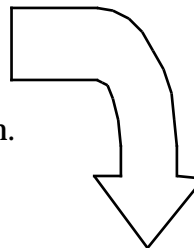
I give you an example:

The student provide an incorrect German sentence:

(3a) \*Familie Braun **sind** in den Urlaub gefahren.

Das Subjekt und das Verb stimmen nicht überein.

*There is an error in subject-verb agreement*



In such an instance, the system detects an **error in subject-verb agreement** and tailors its feedback to suit the learner's expertise. Tailoring feedback messages according to student level follows the pedagogical principle of **guided discovery learning**.

There are three **learner levels** considered in the system:

- beginner,
- intermediate,
- and advanced.

For the example given, the **beginner** will receive the most detailed feedback:

"FAMILIE und SIND passen nicht zusammen. FAMILIE ist singular.

(*FAMILY and ARE do not agree. FAMILY is singular.*)",

while the **intermediate learner** will be informed that an error in subject-verb agreement occurred without identifying subject and verb explicitly. In con-

trast, the **advanced learner** will merely be told of an error in the sentence. The central idea is that the better the language skills of the learner, the less feedback is needed to guide the student towards the correct answer.

This analysis, however, requires:

1. an **NLP component** which can analyse ill-formed sentences, and
2. a **Student Model** which keeps a **record** of the learner's past performance.

The NLP component of the *German Tutor* consists of a **grammar** and a **parser**, as I said before. The system keeps a record of which grammatical violations have occurred and which rules have been used but not violated. The Student Model is a **representation of the current skill level** of the student across different grammatical constructs and vocabulary.

Currently, there are six **exercise types** implemented in the *German Tutor*:

1. Dictation,
2. Build a Phrase,
3. Which Word is Different,
4. Word Order Practice,
5. Fill-in-the-Blank,
6. and Build a Sentence

I'll present to you two of them:

**Dictation** and **Fill-in-the-blank**.

### **Dictation**

The exercise type given in the Figure displays a dictation task which focuses on **listening comprehension** and **spelling**. Students can first listen to the entire dictation by clicking the "Diktat" (dictation) button, or they can listen to each individual sentence by accessing the "Satz" (sentence) button. Once they type in a sentence and it is correct, it will appear above the input box. For instance, the dictation given in the Figure consists of two parts (Satz 2 von 2). The student correctly typed the first part (*Guten Tag! Mein Name ist Fumiko Kanno*) which is displayed above the input box. The student now proceeds to the next

part of the dictation. In the event of an error, students have a number of additional options which are consistent for all exercise types. The student can either correct the error and resubmit the sentence by clicking the "Prüfen" (check) button, or peek at the correct answer(s) with the "Lösung" (answer) button, or go on to the next exercise with the "Weiter" (next) button. If the student chooses to correct the sentence it will be checked for further errors. The iterative correction process continues until the sentence is correct or the student decides to peek at the correct answer(s).

### ***Fill-in-the-blank***

The student's task here is to complete sentences by filling in any blanks that appear. For instance, we display an example task with one blank. For a higher skill level and to make the task more challenging, more than one blank can be contained in the sentence.

In addition to tailoring feedback messages suited to learner expertise, the system also recommends remedial tasks. At the end of each chapter, the system displays learner results and suggests additional exercises according to the number and kind of mistakes that have occurred.

For example, the summary page in Figure 7 states that the student John made one spelling mistake and ten errors in subject-verb agreement with the *Build a Sentence* exercise set. ***Due to the number of errors, the system suggests further exercises on subject-verb agreement.*** The student will receive an individually tailored set of remedial exercises addressing the mistakes s/he made during previous practice. The results can also be sent to the instructor.

## **Study**

The purpose of the study was to determine whether the error-detection given by the system is useful and what kind of adjustments are needed.

During one semester in the year 2000, 33 students from two introductory German classes spent three one-hour sessions using the *Build a Sentence* exer-

cise. In analysing the data, five different *modes of student reaction* have been found:

1. Students corrected the errors explained by the system.
2. Students corrected an error in the sentence, however, not the one explained by the system.
3. Students changed a correct structure.
4. Students resubmitted the same sentence.
5. Students requested the correct answers.

## Results

Without going into details and providing you all the numbers, the study shows clearly that students *attend to system feedback* for the majority of sentences. Students indeed *read the feedback rather than independently correct errors*. The study shows also that the *quick route to the correct answer* was not over-used. Thus, as a final statement:

I-CALL programs can provide a meaningful practice environment.