## STUDIES AND RESEARCH

# The acquisition of miniature languages: The search for a new paradigm

DAVID INGRAM, CLIFTON PYE

*Abstract*

*Miniature language research has had a long but not particularly glorious past. Its studies have been criticized for a number of reasons, e.g. the languages are not natural, they are taught under unnatural conditions, learners are not using language learning skills, the findings are inconclusive, etc.. This article discusses these criticisms and responds to them by outlining a new approach to miniature language studies. This new approach includes presenting miniaturized versions of real languages, and the elimination of direct correction. Foremost among its features is the use of computer adventure games where the player must learn the miniature language in a fictional but naturalistic setting to win the game. Two such games developed thus far are discussed.*

## 1. General issues in language acquisition

Early research into first language acquisition was highly descriptive, driven by the basic need to collect some initial data on how children acquire language. More recent research, however, as discussed in Ingram (1989), is more theoretically oriented. The goal of this more current research is to establish a theory of acquisition, *i.e.* to determine the set of principles which enable the child to acquire any possible language in real time.

There are two fundamental ways in which this goal is being investigated. One of these is *learnability research*, which examines the logical problem of language acquisition. This approach looks at linguistic analyses of natural languages and explores the innate mechanisms needed by the child to acquire such analyses in interaction with the linguistic input that the child would be exposed to. The second way is the more traditional way of studying actual data from children acquiring language. Most of this research has focussed on *natural language acquisition*, *i.e.* the acquisition of known human languages. A variety of methods are used in this research, such as the use of naturalistic lan-

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guage samples, experimental tasks, metalinguistic judgements, and imitation.

There is, however, a second, less established approach to the data based study of language acquisition. This is the study of *miniature language acquisition.* This approach involves the teaching of miniature language systems (MLSs). These are not natural languages, but artificial ones written by the investigators and subsequently taught to human subjects, often children. This research has been conducted since the 1920's, although with much criticism ( *c f.* Ingram, Wollitzer, 1990 for a review).

We are currently developing the use of miniature language acquisition as a research methodology. To do this requires overcoming several deficiencies of previous applications, and the development of a new research paradigm. The basis of this new approach is the use of computer adventure games for the presentation of the MLS. Below we outline the general aspects of our approach. First, we provide an overview of MLS studies and some of their deficiencies. Next, we discuss the ways in which our approach differs from previous research. This is followed by a discussion of two such games which have been developed thus far.

## 2. Overview to Miniature Language Acquisition

The use of miniature languages to study language acquisition traditionally has the following characteristics:

1. The language acquired is one created by the investigator, *i.e.* "artificial";
2. The language is small, typically with a total sentence inventory under 100; hence the term "miniature";
3. The language is taught in the "laboratory"; hence learning conditions are strictly controlled;
4. Subjects are usually adults, or older children;
5. Languages are taught rather than acquired; they may be presented visually without prosodic cues;
6. Use of nonsense words, usually CVCs (consonant, vowel, consonant)

Much of this research has been based on a series of assumptions which are often not explicitly articulated and defended. One assumption is that the MLS is comparable to a natural language. If not, the

results will have no bearing on how language acquisition takes place. A second assumption is that the laboratory conditions used are simulating natural language acquisition in some way. A third important assumption is that the MLS will be acquired by older children and adults using the same mechanisms as younger children.

Each of these assumptions has met with criticism in the literature. The MLSs created by investigators to date mostly do not resemble any known human languages. Some are extremely simplistic and probably capable of being learned without any need to rely on our innate language learning faculty. Others are highly complex in ways quite distinct from human language. Regarding laboratory conditions, many used have not put the learner in conditions like those of natural language learning. Sentences are often presented to the subject in a mechanical fashion, and often immediate correction is provided.

Perhaps most seriously, no MLS study has ever been able to demonstrate that the learner is using the same mechanisms as those used by the child in a naturalistic context. Instead, it is only hoped that such is the case. This point of view is expressed most clearly in Braine (1971, 162): "The claim that pattern learning abilities revealed in the laboratory are actually used in natural language acquisition rests, at the moment, on the inherent plausability of the notion that human beings will use in language learning any abilities which they demonstrably possess and which would obviously be used in language learning."

A last criticism is that the results from this paradigm thus far have been disappointing. This point has been made rather forcefully in the discouraging review of the approach in Schlesinger (1977). He states (253): "Or take the conclusion arrived at by Smith, Gough (1969): 'that in the learning of at least one miniature language, as in the acquisition of natural languages, transformations are in evidence'. On reading such summaries, one can hardly be blamed if one's enthusiasm for MALs [MLSs:DI and CP] flags". Schlesinger's general conclusion is that the most that these studies have done is just to verify what we already know about language acquisition from other methods.

## 3. The development of a new paradigm

It is certainly true that these criticisms are sufficient to make it questionable whether MLS studies as done in the past are a viable approach for

studying natural language acquisition. We suggest, however, that these criticisms are not inherent flaws, but weaknesses that may be overcome. To do this, we propose the following changes to MLS research:

1. *Do not create artificial languages.* By this we mean that researchers should not make up artificial languages without a strong rationale for their development. To get around the artificiality problem, we propose that languages be used which are miniature versions of known languages, or what we call Miniature Real Language Systems (MRLS). These systems can then be altered in ways that have not been found in any known language. By teaching both the documented and nondocumented MLSs, we can directly show the use of natural language learning mechanisms if the former systems are easier to acquire than the latter ones.

2. *Restrict presentations to positive evidence.* Since little evidence exists to suggest that children acquire natural language through direct correction, such correction should be eliminated as much as possible from the MLS learning procedure. The learning context should as much as possible present the sentences of the language in a natural context so that the learner must determine their meaning from context.

3. *Study both rates of learning, and error patterns.* Most previous studies have concentrated just on rate of learning. While it is useful to know if one language is acquired faster or slower than another, it is also important to see the kinds of errors that learners make in acquiring a language. We suggest that the MLS should provide opportunities for the learner to attempt to generalize the language they are learning to new contexts to see the kinds of hypotheses that they are forming about the language.

4. *Develop new procedure for presentation.* Previous approaches have used procedures for presentation of sentences which tend to be repetitive and boring. The only motivation by and large has been some financial reward at the end of the session. Some procedures used include oral presentation (Palermo, Howe 1970), slides (Foss 1968; Moeser, Bregman 1972), and cards (Braine 1963).

Some recent studies have attempted to develop more interesting methods in the form of games. MacWhinney (1982) used three games, which he called families, hotels, and chess. Goldstein (1983) used a puppet show, and two communication games called "King of the Castle" and "Monsters in the Pit" are used in Johnston, Blatchley, Streit

(1990). These are an improvement upon the previous approaches, but suffer from requiring a much more time intensive period for learning.

The procedure which we are developing is one which appears to be quite motivating for children (and young adults), and yet does not involve the more extensive experimenter intervention of the above approaches. This is the use of the *computer adventure game*. These present an adventure context in which the player must solve a series of situations in order to win. We suggest that such games can include the learning of a language as part of solving the game.

The first requirement of this approach is to develop games that children will find interesting to play. With unlimited funding, we could of course develop polished games such as those currently available such as King's Quest and Space Quest. Until such funding becomes available (if ever!), it is still possible to develop more modest games which can still serve this purpose. Our current efforts are to produce verbal adventure games. These are games which do not involve graphics or sound, but only the presentation of text which outlines an adventure. While such games are not commercial successes, they have been around for several years and have a following of sorts. Our initial research also suggests that children as young as eight years old are willing to play them, and even sustain interest over a period of time.

The idea is to explain to the player at the onset that their primary goal in their adventure is to acquire a strange language. Sentences of the language are presented to the player in context, and they need to extract their meaning from these contexts. Below, we explain in more detail one such procedure in the games we called Kiche Adventures.

The computer adventure game has several advantages to previous methods which make it potentially a methodological breakthrough. One advantage is that we can record the child's progress in learning the language by having the game program write their answers to a file on the game diskette. We can also have the game program code the children's responses into several variables for later analysis. The general effect is an extremely efficient testing technique. For example, Johnston ,Blatchley, Olness (1990) ran 15 subjects over approximately three months, using at least two research assistants. As we outline below for Jonstown Adventures, we can replicate this study with the same number of subjects in one day in the computer laboratory. Thus, the computer adventure game technique has the advantage of expanding the

languages tested, and the number of subjects tested.

## 4. Two computer adventure games

We have so far written two computer adventure games. This has been done by using the Adventure Game Toolkit (AGT) developed by Malmberg and Welch. The AGT is a program which was developed to enable users to write verbal adventure games. It provides sample games along with a detailed manual for more advanced usage. The AGT also has a function which directs all input to the keyboard to a printer. We subsequently also use a utility program entitled PRN2FILE.COM which redirects everything sent to a printer port to a file on the diskette. In this way we can record all of the players responses while they are playing.

The first game we have written is called *Jonstown Adventures*. An outline of its basic characteristics is presented in Appendix A. Jonstown Adventures attempts to replicate the study done by Johnston, Blatchley, Olness (1990) on the acquisition of VSO versus SOV languages and object suffixes. Our game has been written to see if our method can replicate the results of another study using a different methodology.

A second and more ambitious game is actually a series of games entitled *Kiche Adventures* (see Appendix B). These games require the acquisition of an MRLS called Kiche which is based on the language K'iche', a Mayan language spoken in Guatemala. In learning this language, the player learns a series of verb forms which take subject and object affixes. The important feature of Kiche which we wish to study is that fact that it is an ergative system. In Kiche, the subjects of intransitive verbs take different subject affixes than do the subjects of transitive verbs.

There are several goals which we are pursuing in the development of the first version of this game. One set of goals are methodological ones. We want to see if subjects can actually learn an ergative language in the adventure game context. Also, we want to determine what age limits may exist.

Other goals are more theoretical in nature. One is to see how the order of the affixes affects learning. In the first version of the game, the subject markers are prefixes and the object markers are suffixes, roughly

following the English ordering of pronouns. In a future game, both markers will be prefixes, with the object preceding the subject, as is the case in K'iche'. Another goal is to see how many exposures to sentences is required for children to generalize presented patterns to new sentences not previously seen. In the first version, each new sentence is presented twice before generalization is required.

The most ambitious goal of *Kiche Adventures* is to see if children use natural language learning strategies as distinct from general problem solving abilities. This is being done by using two different versions of Kiche, one which follows known ergative languages and one has a pattern which has never been documented. In terms of complexity, both miniature languages are equally complex, and both are equally different from English. If general problem solving abilities are being used, then both games should be acquired at the same rate. If language learning abilities are used, however, the natural language should be acquired faster. We can further compare the subjects' acquisition of the natural language with K'iche' children's acquisition of their language (Pye 1990; Pye in press) to insure that our subjects are using natural language abilities.

This aspect of naturalness is being studied in Kiche Adventures in one further way. At one point late in the game the player must create new verb forms which they have not seen before. There are two options available to the player-one would be consistent with known ergative languages, and one would not. Again, we can observe which option is followed to see if language learning abilities are being used.

## 5. Concluding remarks

The early promise of miniature language research was never really fulfilled. There is probably not a single finding on normal language acquisition which can be traced back solely to this line of research. We maintain, however, that the problems in the procedure can be by and large overcome in the paradigm we outline above. By the use of computer adventure games, we can present the child with a procedure that is inherently interesting so that more complex languages can be presented than ever before. Further, the ease of presentation will enable us to test subjects in unprecedently numbers once the technique is perfected. Before, the acquisition of exotic patterns of language such as ergativity

required extensive fieldwork that only included data from a small set of subjects. The present approach gets around much of this problem, and opens an enormous number of interesting linguistic questions that for all intents and purposes will be available for study for the first time in history.

**Appendix A.** *JONSTOWN ADVENTURES*

These games attempts to duplicate the overall structure of the study reported in Johnston, Blatchley, Olness (1990). There are three games to the JONSTOWN ADVENTURES. They were written by Tanya Hill.

*LANGUAGE*: The language is a VSO language, with 36 sentences.

*Nouns* : BASH, FAK, MEED, ZUNE

(They are creatures that live in a mystical kingdom)

*Verbs* : HEV, GERT, LING

(These captures basic actions of throwing, kicking and carrying).

*Object Suffix* : —00

*Example:* HEV BASH FAKOO ("The BASH is carrying the FAK")

*Game 1*:

The player is a student who must write a book report. She goes to the library and gets a book which tells a story about a mystical kingdom. The player reads the story, which is about the battles between BASH and FAK on one side, and MEED and ZUNE on the other. This game teaches the child the seven words in the language.

*Game 2*:

This game begins by testing the player's knowledge of the seven words presented in Game 1. The player must get six correct in a row before proceeding. The player then gets to meet the creatures BASH and FAK who take her to the mystical kingdom. The creatures speak to the player and show her ten pictures of previous encounters between all four creatures. These pictures are described by ten sentences of the miniature language.

*Game 3*:

The player here must now use the miniature language to describe further pictures which are presented. There are two tasks: comprehension and production. For comprehension, an action is described and the player selects one of three sentences as the correct description. For production, the player must produce a sentence to describe the action. These are alternated. The player is given the correct response if an error is made

on the comprehension task. On production, however, correction is only given in two of each three trials. Each third trial is a probe to test for generalization. The game is completed when there are six correct probes in a row or 72 trials have passed.

**Appendix B.** *KICHE ADVENTURES*

These games consist of an adventure in which the player, named Uncle Bob, must travel to Guatemala to save his Uncle Dave who has been captured by a sorceress by the name of Wicked Heaghar. Bob is met at the airport in Guatemala City by his guide, Pittsburgh Cliffie, who leads him on his adventure. Cliffie explains that Bob has to acquire the language Kiche in order to save Uncle Dave.

*LANGUAGE* :

Mini Kiche is a miniature language which consists of English nouns and Kiche verbs. It is an SVO language. The verbs are divided into two classes: intransitive verbs and transitive verbs. Each of these classes has its own set of subject person markers which are prefixed to the verb stem. Also, the transitive verbs, when there is no noun object, take object markers which are suffixed to the verb root.

*Intransitive verbs*:—WIK(call),—REP (read),—NAZ (open),
—TUM (pull)

*Transitive verbs:* —LAT (ask), —MUP (see), —BIS (push), —ON (shoot)

| *Subject Prefixes:* | first person | second person | third person |
|---|---|---|---|
| | ON— | AW— | TE— |
| | NI— | AT— | KU— |

*Some Sample Sentences:*

| Intransitives | Transitives |
|---|---|
| ONWIK "I'm calling" | NILAT CLIFFIE "I'm asking Cliffie" |
| AWREP "You're reading" | ATMUP TRUCK "I see the truck" |
| TENAZ "He's opening" | KUBISPA "She's pushing them" |

*PROCEDURE:*

The player is given instructions at the beginning of the game about how to play adventure games. There are just a few English commands that can be entered. Most of the time, the player will need to use *MINI KICHE* words to solve the game. (A set of instructions is shown below).

Each time a player sees a new Kiche word, they are to GET the word

for their diary. If they get the word, they can look at it at any time during the game by typing *DIARY WORD*, where WORD is the word they wish to see. When they do this, they get a diary entry which explains the context in which the word was used.

*KICHE ADVENTURES* consists of five games. They are structured as follows:

*Practice Game*:

This is a short game which gives the player the chance to learn how to play the game. It presents 7 intransive verb forms and the player needs to generalize to produce an eighth one. These are as follows: (the verb which is NOT presented is in *CAPITALS*)

| | call | read | open | pull |
|---|---|---|---|---|
| *first person* | onwik | onrep | onnaz | ontum |
| *second person* | awwik | awrep | awnaz | AWTUM |

*Game 1: "Jungle Bound"*

This game begins a series of four games that examine the acquisition of MINI KICHE. The first part of the game repeats the practice game. The player meets Cliffie and goes on an adventure to get to the jungle. They are chased by a mob and an assassin before getting to their camp.

The player is given six intransitive Kiche verb forms and must generalize to three others to finish the game. These nine forms are as follows: (Again those in CAPITALS are not presented)

| | call | read | open |
|---|---|---|---|
| *first person* | onwik | onrep | ONNAZ |
| *second person* | AWWIK | awrep | awnaz |
| *third person* | tewik | TEREP | tenaz |

*Game 2*: "The Search for Wicked Heaghar"

In this game the player struggles through various adventures in the jungle before finally reaching the cave where Wicked Heaghar is keeping Uncle Dave. This game presents six transitive verb forms, and the player must generalize to three others. These nine forms are as follows:

| | ask | see | push |
|---|---|---|---|
| *first person* | nilat | NIMUP | nibis |
| *second person* | ATLAT | atmup | atbis |
| *third person* | kulat | kumup | KUBIS |

*Game 3*: "The Search for the Magic Mirror"

This is the critical game in the series. The player manages to infiltrate Wicked Heaghar's cave and talk to Uncle Dave. To do so, how-

ever, she must produce nine transitive verbs with object suffixes. The player is given enough information to determine that the verbs take suffixes, and must select the suffixes from those which have been learned so far. There are three possible patterns of response:

1. *Random:* select the object forms from both the set of transitive person markers and the set of intransitive person markers.

2. *Natural ergative:* select the person markers used for the intransitive verbs. This would produce the common ergative pattern found in several languages.

3. *Unnatural ergative:* select the person markers used for the transitive verbs. This would produce an ergative pattern not attested in any known human language.

*Game 4*: "The final Quest"

Here the player must go back to Guatemala City and obtain the magic sword which ends the game. It tests some further generalizations of the verb forms acquired. Most importantly, it no longer selects any of the patterns mentioned above. Instead, the player cannot proceed unless they use one pattern consistently. They are given the pattern opposite to the one that they used in Game 3.

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*The University of British Columbia*
*(Department of Linguistics, 369 - 1866*
*Main Mall. Vancouver*
*B.C. Canada V6T 1W5)*
*and The University of Kansas*