

Center for Second Language Classroom Research  
Social Science Research Institute  
University of Hawaii at Manoa

Technical Report No. 6

PLANNING, MONITORING, AND SECOND LANGUAGE DEVELOPMENT: A REVIEW

Graham Crookes

February, 1988

# PLANNING, MONITORING, AND SECOND LANGUAGE DEVELOPMENT: A REVIEW

Graham Crookes

## Abstract

It is argued that second language development is an instance of the development of a cognitive skill, in which the factors of planning and monitoring may be expected to play important roles. Research and theory in both these areas are reviewed as they apply to the development of oral second language by adults, and a program for research is presented.

## Acknowledgments

The author is most grateful to Craig Chaudron for his careful work in supervising the development of this report at all stages. Kate Parker's insightful comments are also greatly appreciated.



Technical Reports  
of  
The Center for Second Language Classroom Research  
Social Science Research Institute, University of Hawaii at Manoa

The opinions expressed in Technical Reports of the Center for Second Language Classroom Research are those of the authors, and do not necessarily reflect the views of the Social Science Research Institute, of the University of Hawaii, or of the funding agency. This report was published by the Social Science Research Institute, University of Hawaii at Manoa. All rights reserved. No parts of this Report may be reproduced in any form or by any means without the prior written permission of the Director, Social Science Research Institute, University of Hawaii at Manoa.

Additional copies of this and other Technical Reports may be obtained for \$2.00 each, which includes printing and postage, by writing to the Director, Center for Second Language Classroom Research, Social Science Research Institute, c/o Moore Hall 570, 1890 East-West Road, University of Hawaii at Manoa, Honolulu, Hawaii 96822, U. S. A. Checks should be made out to the 'Research Corporation of the University of Hawaii'.

1. Michael H. Long, Cindy Brock, Graham Crookes, Carla Deicke, Lynn Potter and Shuqiang Zhang. 1984. The effect of teachers' questioning patterns and wait-time on pupil participation in public high school classes in Hawaii for students of limited English proficiency.
2. Michael H. Long. 1985. Bibliography of Research on Second Language Classroom Processes and Classroom Second Language Acquisition.
3. Graham Crookes and Kathryn A. Rulon. 1985. Incorporation of Corrective Feedback in Native Speaker/Non-native Speaker Conversation.
4. Graham Crookes. 1986. Task Classification: A Cross-Disciplinary Review.
5. Craig Chaudron, Jan Lubin, Yoshi Sasaki and Tom Grigg. 1986. An Investigation of Procedures for Evaluating Lecture Listening Comprehension.



## The Center for Second Language Classroom Research

University of Hawaii at Manoa, Spring 1988

The Center for Second Language Classroom Research (CSLCR) was established at the University of Hawaii at Manoa in the fall of 1983. Administratively part of the University's Social Science Research Institute (SSRI), it is a joint venture of SSRI and the Department of English as a Second Language (ESL).

SSRI provides a 50% time position for the Center's Director, (currently Dr. Craig Chaudron), who is a faculty member in the Department of ESL, plus administrative and technical support. Funded by outside grants and contracts, additional CSLCR staff have been drawn from the faculty and students of the Departments of ESL, Linguistics, and Educational Psychology.

The work of the CSLCR includes research, curriculum development and training projects in the general area of second language (SL) education. This includes basic and applied research on SL teaching and learning, on education through the medium of a second language, and on classrooms where second dialects are present (e.g. Hawaiian Creole English). English and other second languages are included in this work. The Director of the Center coordinates all research projects and actively pursues new projects and collaborations with other agencies.

2

2

2

2

## CONTENTS

1. Introduction	1
1.1 Rationale	1
1.2 Presupposition	1
1.3 Argument	1
2. Planning	3
2.1 Planning and artificial intelligence	3
2.2 Uses of the term 'planning' in linguistics	5
2.3 Planning as a SL learning strategy	8
2.4 Planning within a model of language production	8
2.4.1 L1 work	8
2.4.2 L2 work	11
2.5 Planning in SLA research	15
2.6 Summary	17
3. Aspects of monitoring	19
3.1 Introduction	19
3.2 Attention and style shifting	19
3.2.1 Attention in the information-processing model	23
3.2.2 Problems with attention	24
3.2.2.1 Problems with the concept of attention	24
3.2.2.2 Problems with the information-processing model	24
3.3 Monitoring	25
3.3.1 Monitoring as a second language strategy	25
3.3.2 The distraction of 'Monitoring'	26
3.3.2.1 Krashen's position	26
3.3.2.2 Criticisms of Krashen's Monitor	27
3.4 Processing approaches to monitoring	28
3.5 Personality traits, culture and monitoring	30
3.6 Interim summary	32
4. Conclusions and agenda	33
4.1 The problem	33
4.2 The role of monitoring alone	33
4.3 Skill learning, planning and monitoring and SL development	36
4.4 Agenda for future research	38
4.4.1 Preliminaries to an agenda for future research	38
4.4.2 Agenda details	40
4.5 Pendulum swings?	43
Notes	44
References	45
Appendix: a note concerning explanation	56





# PLANNING, MONITORING, AND SECOND LANGUAGE DEVELOPMENT: A REVIEW

Graham Crookes

## 1. Introduction

### 1.1 Rationale

The present report provides an overview of the literature on planning and monitoring as it applies to language use and development, with the goal of establishing a research agenda concerning the relationship of these aspects of cognition to second language learning.

The study of second language (SL) learning is obviously an interdisciplinary endeavor. However, its development has been hampered by a tendency in the SL field until recently to be inward-looking -- to base theories or (usually more accurately) conceptual models on an unduly narrow reading of applied linguistics research, and of the major contributory disciplines. This lack has led to the formulation of simplistic frameworks (see section 3) which cannot support the empirical work needed in exploring SL learning issues. Unless it is assumed that the development of the ability to use a second language is a matter entirely separate from other human learning, the general psychological processes involved in learning (whether unconscious or not) and the existing psycholinguistic mechanisms possessed by the learner (by virtue of speaking a first language) must be taken account of by SL researchers. It is essential to build on what is already known about these systems in basic conceptualization and subsequent theory construction. Previous failure to do this has led to an inadequate treatment of two important cognitive processes in language production and development: monitoring and planning.

### 1.2 Presupposition

It is assumed here that the current best conceptual model concerning the system which is developed in SL learning is a model of the language production system of the sort commonly found in psycholinguistic literature (e.g., Butterworth 1980c), conceived of as a sub-component of the basic information-processing (IP) model of human cognition (whether in its standard sequential form, or more recent parallel/interactive models).

### 1.3 Argument

It is generally accepted by psycholinguists that a number of stages can be distinguished, at least conceptually, in the production of an utterance. Initial stages must involve idea generation, and the formulation of some of the lexical and syntactic elements which will appear in the final speech. There are convincing suggestions (see Section 3) that the speaker may optionally consider the products of this system, perhaps while the utterance is being formulated, and at least in the process of

articulation. The former may be said to be a form of planning; the latter is often referred to as monitoring. Moreover, with the exception of activities which are fully automatic or totally inaccessible to conscious inspection, any cognitive activity can be planned, which may be likely to happen when the activity is difficult, unfamiliar, or of high risk (De Lisi 1987). In the same circumstances, humans also often pay close attention to the way they carry out the plan -- that is, we monitor our behavior (cf. Faerch & Kasper 1983:23; Anderson 1981). Obviously, the production of second language speech by a learner often may be described as difficult, unfamiliar, not automatic, accessible to consciousness, and involving risk (at least to 'face'). (These also apply to SL writing, though this will not be considered here.)

On the basis of the evidence to be reviewed, it can be shown that these two concepts, planning and monitoring, are of considerable ultimate importance for an understanding of second language performance, and, in addition, learning. The use of planning and monitoring in the performance of a cognitive skill such as SL processing may well be necessary for the development of some aspects of the skill.

The ability of the SL field to perceive the importance and relevance of these cognitive processes has been hindered partly by general trends mentioned in Section 1.1, and partly by a bias favoring description of cognitive structures rather than analysis of their development, in relevant literature outside the immediate applied linguistics purview. In addition, conceptual and definitional problems abound, because (1) the terms planning and monitoring are ordinary-language terms in general use, and (2) conceptions from other research traditions have sometimes been carelessly applied to SL aspects of these areas.

At this point it is not appropriate to give precise definitions of the terms since the body of the review will consider a wide range of usages. In general, however, planning may be thought of as cognitive processing necessary for, or intended to aid performance of behavior prior to its execution, whereas monitoring relates to the control of the execution of behavior. This review will not attempt to settle distinguishability of these two concepts for SL learning and performance, which is an open empirical question at present. This is at least partly because of the imbalance in research on these topics. Of the two, monitoring has received the preponderant emphasis in the work of second language acquisition (SLA) specialists, though this has been largely misguided, while planning has been unduly neglected.

This review is intended to begin to redress these failings. It is organized according to the following plan: the next two sections consider in turn planning and monitoring. The fourth section summarizes, and provides some speculation concerning the role of these two cognitive processes in second language learning, and sketches a possible future research program.

## 2. Planning: introduction and terminology

It is generally accepted that in human beings, complex intentional behavior which is not genetically programmed often involves a plan (De Lisi 1987:80, Johannsen & Rouse 1983, Schank & Abelson 1977). The making of plans is a familiar activity - a natural part of our daily life in anticipating future events and activities, and generally taken to be a matter largely accessible to consciousness (Friedman, Scholnick & Cocking 1987). The ubiquity of the concept has resulted in the word being used in many ways (for review, see Scholnick & Friedman 1987). A useful distinction is that of De Lisi, between functional and representation plans:

the plans of...human infants...are "pure" function... sequences of behavior directed toward a goal without a preexisting and deliberate symbolic representation of the to-be-performed actions. In the course of human development, the representational component of plans arises and serves to direct the functional component. In a given...instance... this would continue to the point at which behavior becomes routinized as in skill development (Frese & Stewart, 1984). At the point of routinization, the representational component of a plan diminishes in importance unless something disrupts the usual behavioral routine.

(De Lisi 1987:88)

Planning with regard to speech has been conceptually divided into planning for aspects of discourse relatively distant and those almost contemporaneous with the planning. This definition has been termed macro- and micro-planning (Butterworth 1980b), or pre- and co-planning (MacWhinney & Osser 1977). The term 'planned speech' has been used for speech which has been given extensive consideration in advance, or stretches of discourse subjected to review concerning topics which an individual may have spoken about more than once (Ochs 1979). The term as used by those building on the research of Ochs (e.g. Ellis 1987) may encompass more than the meaning given it by those following the work of Butterworth (e.g. Berg 1986a, b -- see Section 3.4).

Initial consideration will be given to artificial intelligence investigations, because of their historical primacy. First language discourse analysis applications are then reviewed, leading into first and second language processing investigations. The section concludes with a brief discussion of the most prominent recent SLA study related to planning, noteworthy particularly because of its dependence on L1 discourse analysis, interlanguage studies and monitoring.

### 2.1 Planning and artificial intelligence

The concept of 'planning' has a long and respectable history in cognitive science -- as Newman & Bruce (1986:167) say,

ever since the publication of Plans and the Structure of

Behavior (Miller, Galanter & Pribram, 1960), the analysis of plans has played an increasingly important role in studies of cognition and cognitive development.

The ideas of Miller et al. played a very important role in the development of the classic information-processing model of human cognition. These researchers are also regarded as pioneers in the section of cognitive science which depends most heavily on computer modelling: Artificial Intelligence (AI) (Russell 1984). Perhaps for this reason, a substantial line of work on 'planning' has developed with an orientation towards formalism and modeling-by-program (Hobbs & Evans 1980:350). The topics addressed include general human planning of complex tasks (e.g. Hayes-Roth & Hayes-Roth 1979) social interaction, and increasingly, aspects of language (e.g. Hobbs & Evans 1980, Newman & Bruce 1986, Cohen & Perrault 1979). The basic conception of planning used is straightforward:

we define planning as the predetermination of a course of action aimed at achieving some goal.

(Hayes-Roth & Hayes-Roth 1979:275)

Most work in this domain has not concerned the planning of language specifically. Typical of the little which does relate to language is Hobbs & Evans' (1980) account of a model of speech act planning in dyadic conversation. Speech act theory (Austin 1962, Searle 1969) is concerned with individuals' use of language to attain objectives. Its goal-oriented analysis lends itself to AI applications. The resulting product tends to be a description or simulation of the steps involved in planning, rather than an explanation of how planning is carried out by the cognitive information-processing system, or its results. Some indication of the style, content, and depth of analysis is evident in the following:

A human problem solver can be regarded as "executing" a plan that prespecifies the sequence of actions to be taken...Such plans involve the communication of beliefs, desires and emotional states for the purpose of influencing the mental states and actions for others... a theory of speech acts based on plans should specify at least the following:

-- A planning system: a formal language for describing states of the world, a language for describing operators, a set of plan construction inferences, a specification of legal plan structures. Semantics for the formal languages should also be given. (Cohen & Perrault 1979: 178-9)

The intent of this line of investigation, and the form its results take might seem at first glance to be of limited benefit to SL researchers. For example, it has been observed that

AI ask[s] how instances of intelligence can be realized... within the constraints of known computational mechanisms... whereas cognitive science places greater emphasis on the question of how instances of intelligence are in fact

realized within...the human mind. (Pylyshyn 1987:120)

The end products of AI are usually formal models (Black & Champion 1976:68-9), which have a one-to-many rather than one-to-one relationship (Youngquist 1971:4) to the human cognitive system. They are validated in terms of the predictions they can make about human action, or in terms of the accuracy which which they mimic it, but not in terms of the degree of isomorphism their internal structures and intermediate states have to those which might exist in the human cognitive system (see e.g. Pylyshyn 1981). By comparison with other domains of cognitive science, there is less use of empirical data obtained from "flesh and blood subjects" (Russell 1984:137). Pylyshyn states that as opposed to AI researchers,

many experimentally oriented cognitive scientists tend to place a somewhat greater premium on empirical fit, on testing processes against psychological data to determine not only whether the two are input-output equivalent but also whether they are strongly equivalent, that is, whether in both cases the behavior is produced by the same information-processing means. (1987:120)

On the other hand, the detailed descriptions of possible ways humans use limited resources to accomplish the more demanding forms of cognitive tasks given by this research provides a greater understanding of humans' intelligent and considered interaction with their environment, and an indication of how planning is a generally applicable means for accomplishing tasks not in our immediate command. In addition, AI influences on cognitive psychology are growing, and given the similarity between certain AI formalisms and those in linguistics (e.g. Post systems, phrase structure rules, and Newell production systems) this line of work may be more influential on SL research in the future.

## 2.2 Studies of planning in linguistics

The limited amount of research done within linguistics on this topic (in the sub-field of 'discourse analysis') has considered only native speakers (NSs). A distinction between planned and unplanned language has been made (Ochs 1979:55):

- 1) Unplanned discourse is discourse that lacks forethought and organizational preparation.
- 2) Planned discourse is discourse that has been thought out and organized (designed) prior to its expression.

Unfortunately, Ochs takes the degree of planning as an a priori aspect of particular types of discourse -- and is unsatisfactorily vague about the amount and nature of planning involved. For example, she says that "truly spontaneous conversation is, by definition, relatively unplannable well in advance". However, even within planned discourse it would appear that there may be variation in the degree of planning:

a speaker may produce a well-thought-out, well-designed predication, but the predication may unintentionally contradict a previous or subsequent predication in the discourse. (51)

Presumably Ochs is saying that in the (hypothetical?) example referred to, the "planned" discourse is in some sense not fully planned, else there would have been no contradiction.

Ochs's investigations of the topic are based on (1) spontaneous oral narratives, and (2) written versions of the same narrative by the same individual. The latter are clearly planned. In summarizing work done up to that time, Ochs (1979) notes that in unplanned speech there is

- 1) greater reliance on immediate context to express propositions;
- 2) greater reliance on developmentally early morphosyntactic features (for example, verb voice, tense, and use of subordinating conjunctions);
- 3) more word replacement and word repetition within speakers;
- 4) more repetition of conversational elements across speakers.

Ochs's (1979) discussion of the topic leaves some room for scepticism, however, since her conclusions appear to be based on her personal interpretation of selected examples from a variety of corpora. Some of these findings are supported in more detail by the papers in Ochs Keenan & Bennett (1977). In particular, Kroll (1977) provides a detailed study of the relative use of subordination in planned language, with careful definition of units of analysis and quantification of features within a particular corpus. Most of the papers in this collection are based on a corpus of unplanned oral narratives, together with written versions of the same narrative produced by the same individual. There is thus an unfortunate confound between planning and modality. The restrictions and conventions of writing may have major effects on the differences found between the pairs of narratives, and prevent their direct ascription to the effects of planning. A related criticism has been made by Tannen (1982):

Ochs's important essay clearly identifies significant distinctions, but they seem to be more a matter of register than planning...differences in features of the type which Ochs attributes to planning seem to be far more responsive to changes in genre and context than to changes in planning time...Some people, at least, are able to produce prose that sounds either academic and 'planned', or informal and spontaneous, in the time it takes them to pass a pen over paper or hit typewriter keys. What seems to determine their choice of words and structures is their sense of what is appropriate to the context. (1982:6)

Whilst Ochs's work provides a starting point for considering the matter of planning in language across modes, it does not help to

pin down degrees of planning in oral discourse.

The first investigator to have attempted such an investigation was Danielewicz (1984). Using data from a larger study (Chafe 1982); her "preliminary analysis" deals with two eight-year-olds, two twelve-year-olds, and two adults -- all native speakers -- and follows closely from the papers in Ochs Keenan & Bennett (1977) in conception and design, except that it deals with all four possible combinations of planning and modality. Only the results for adults will be summarized here.

The samples of adult unplanned spoken language were taken from "dinner table conversations"; their planned spoken language was "class lectures or prepared talks"; the adults were "members of the academic community" (1984:245). Although Danielewicz refers to "planning time", this was not actually controlled or measured at all. For each subject in each condition, a sample of 100 'idea units' (Kroll 1977) was collected.

Danielewicz provides some impressionistic observations concerning broad differences between the adults' planned and unplanned speech:

planning affects discourse schemas at the global rather than at the local level of utterance. For instance, planned spoken texts are generally organized around a central theme or argument...[p]lanning time seems to influence the amount and type of evidence that a speaker uses to build an argument and affects the ways in which meaning is threaded through the discourse. (253)

Her more detailed analysis relates to the following results:

	unplanned	planned
Words per idea unit	7.09	7.42
Dependent clauses		
subordinate	19.00	31.00
relative	20.00	30.00
complement	18.00	57.00
Total Dependent	57.00	118.00
Coordinate Clauses	89.00	81.00
Nominalization	1.60	22.00
Attributive Adjective	49.00	74.00
Participles	18.00	14.00

(Danielewicz 1984:249).[1]

With regard to dependent clauses, she observes that the increase for planned speech is mainly due to the increase in verbal complement clauses. She cites Michaels & Collins (1984): "verbal expansion, as opposed to nominal expansion may be a strategy more common in spoken than in written language." Besides this area, she observes that

planning affected...nominalizations and attributive adjectives [which] indicates that the choice of individual



lexical items may be affected by planning. However, the use of these structures did not seem to affect the number of words per idea unit. The size and shape of idea units vary little from unplanned spoken to planned spoken, suggesting that speakers in a planned context replace individual items rather than adding to or rearranging the basic unit used in unplanned spoken language. (254)

## 2.3 Planning as a SL learning strategy

An implied advocacy of using planning consciously in SL learning has been in existence in second language literature at least since the 'good language learner' studies (e.g., Naiman, Fröhlich, Stern & Todesco 1978), which provided evidence[2] that better than average SL learners used a variety of strategies, among them planning.[3] Consequently, it has been suggested that other SL learners should also utilize this strategy (e.g. Rubin & Thompson's 1982 self-help guide).

No further substantive work was done by these investigators, but as a result of the increasing popularity of 'learning strategies' in mainstream educational research, (see e.g. Segal, Chipman & Glaser 1985), there has been a recent renewal of interest in the topic in ESL. One of the few recent pieces of empirical research on 'planning' in this context is reported in O'Malley, Chamot, Stewner-Manzanares, Russo & Kupper (1985). In this investigation, the form of planning used was "functional planning", which

involves having the learner analyze the requirements of a communication task to determine if he or she has the language skills necessary to fulfill those requirements ...and then proceed to learn new language as required for the task. (1985:573)

Since measures of success on the language tasks used were global, and the use of functional planning was deliberately grouped with use of other strategies, this investigation can unfortunately not tell us anything about the specific effectiveness of planning in language production or learning. It does however provide an example of (a) one way in which the term is in current use in SL work, and (b) of how it is assumed to be of benefit to language production and learning.

## 2.4 'Planning' within a model of language production

### 2.4.1 L1 work

Most models of language production have adopted the standard information-processing model -- see e.g. Clark & Clark (1977) -- and utilize in particular data concerning speech errors and pausal phenomena (see e.g. Garrett 1975, Fromkin 1971). Foss & Hakes (1978) provide a fairly detailed, consensus model of first language production. They state that

[s]entence production includes the formulation of an idea that initiates an act of speaking and the choice of an appropriate linguistic framework into which to cast it. These, what we might term the "planning" aspects of production include such things as finding appropriate lexical items to use and arranging them in a suitable semantic and syntactic framework. (170)

A large amount of speech production research which involved the use of the term 'planning' has been concerned with attempts to determine what the units were on which the production system operated -- whether word, clause, phrase or some other unit. Initial arguments were largely based on pausal data, on the grounds that the system could translate a 'unit' into speech and would then pause as another conceptual unit was formulated (e.g. Goldman-Eisler 1958, Boomer 1965, Rochester & Gill 1973, inter alia). Subsequently, arguments based on speech error data were added. This line of research assumes that a conceptual or propositional 'plan' is converted into speech, and that it is possible to work back from speech data to induce the nature of the elements of the 'plan'. (It does not consider 'pre-planning,' for example.)

Early studies in this line (e.g., Goldman-Eisler 1968) assumed that the relationship between planning and speech is one of simple temporal precedence. However, more recent studies allow for a measure of simultaneity.[4] Thus Ford (1982:820) observes that

the data of the present study and that of Ford and Holmes 1978 suggest...that although a speaker may have a very general idea about most or all of a sentence before uttering it, a complete representation of the sentence is not worked out before its initiation and the detailed planning is carried out basic clause by basic clause as the sentence is produced.

(See also Boomer 1978 and Brotherton 1979.)

A more recent attempt at synthesis in the tradition of Foss & Hakes is provided by Butterworth (1980c), based on a set of partial model-building efforts in Butterworth (1980a). By comparison with Foss & Hakes' model, the stage labeled 'Message formulation or plan' is expanded to contain a semantic system, a prosodic system, and a pragmatic system. In addition, a distinction is made between 'plan' and 'planning': whereas a "Plan" is "a representation interven[ing] between the speaker's intention and manifest phonation" (1980b:156),

Planning [is] ... operations required to formulate a Plan. Often this will be equivalent to the operations in transducing one Plan into another...Insofar as Planning...imposes a cognitive load, say, through the availability of many choices, or through the unfamiliarity of the current sequence of Planning operations, then pauses

will surface in the speech stream. (157)

(This distinction has also been used in SL-related discussions: Faerch & Kasper 1983:23-4.)

Planning is subdivided: "micro-Planning"

is concerned with purely local functions, like marking clause boundaries and selecting words...and, as it turns out, speakers only start to search for a word when it is needed for the next phrase. (159)

"Macro-Planning" operates at a higher level, and

concerns the long range semantic and syntactic organization of a sizeable chunk of speech and therefore cannot be carried out locally. (159)

On the basis of research concerning the position of the semantic system in the production of extended utterances, Butterworth states (1980c:456) that

[i]t is unclear how extensive a plan can be formulated at one time, but plans for up to about 12 clauses have been reported (Butterworth [1980a], Beattie [1980]).

These would appear to be semantic plans, i.e. ones in which the syntactic and lexical elements have not been explicitly selected. When it comes to the operation of the syntactic system, planning may be more restricted:

The syntactic system appears to operate one clause at a time. The data in support of a clause-by-clause functioning comes from the distribution of pauses within clauses.  
(Butterworth 1980c:457)

Some indication of the "size" of the planning units (in terms of their final manifestation) is given by Beattie's (1980) study of non-verbal communication and language production in dyads, which concludes that the clause is not "the fundamental unit of encoding" for three reasons:

- [1] the majority of clauses did not contain a hesitation in the clause-initial position, or at any location in the clause...
- [2] a macro-structure in the hesitations data [emerged] which suggests that higher-order units (in the region of 8.80 clauses) are involved in the planning of speech...
- [3] analysis of the relationship between clause-length and the probability and duration of hesitations and secondly from analysis of speaker gaze...suggest that the functional relationship between hesitations and the planning of clauses is context-specific, holding only for clauses in the hesitant phases of temporal

cycles... (80)

His study supports the work of Butterworth (1975) to the effect that "the main encoding units are suprasentential in scope and semantic in nature" (Beattie 1980:81). This conclusion is also arrived at by Holmes (1984). On the basis of pausal data derived from the continuation of narratives, Holmes argues that basic clauses are not planned and output independently, but are planned "as an integral part of a higher-order unit" (129), which may consist of several sentences.

#### 2.4.2 L2 work

Very little second language research has been based on an explicit language production model. Wiese (1984) notes:

Research specifically concerned with models of L2 production is scarce...[and] adequate standards of empirical research are not always met. (16)

Indeed, second language learning research has hardly begun to make use of the concepts of cognitive information processing which are taken for granted by L1 language production and comprehension researchers. This, though, may be a reflection of a general trend in cognitive psychology (Andre & Phye 1986:15):

the major thrust has been to describe the cognitive systems that support language use in the mature [NS] adult...less emphasis has been place on describing...how [they] were acquired in the first place. Cognitive psychology focused on the description of ongoing cognitive processes, not on the acquisition of those processes.

McLaughlin, Rossman & McLeod (1983:147) observe:

For some time now, experimental psychologists have approached language as linguistic information that must be processed in order to be understood. There has been relatively little research on either first or second language learning from this conceptual point of view.

Although little attention has been given to planning by researchers concerned with L2 production models, it is understood to be a part of any model of speech production, whether L1 or L2. For example, Hulstijn & Hulstijn (1984:24), in introducing a discussion of L2 research, accept the relevance of L1 processing work in the following passage:

According to psycholinguists (e.g. Clark & Clark 1977) the speech production process consists of the conceptualization of a message, the planning of an utterance, and the articulation of the planned utterance. These three processes take place in an incremental and interactive way (Kempen 1977; Kempen and Hoenkamp 1982; see also Hatch 1983). Planning involves the activation and retrieval of

knowledge about linguistic forms and their meanings, stored in the speaker's memory. It has been suggested that there are several stages in the planning and execution phases of speech production, during which speakers review their utterance plan and may or may not decide to change it.

As observed above, much development of L1 production models has utilized speech errors and pausal phenomena. Few L2 researchers have drawn on this data. Seliger (1980) states

Many in the literature of psycholinguistics have looked at this side of language performance...However, no one to the knowledge of this writer has looked at the significance of this data for understanding the sentence planning strategies of adult second language learners. (88)

The studies collected in Dechert & Raupach (1980) and Dechert, Möhle & Raupach (1984) bring together much of the L2 psycholinguistic production literature. In these reports, planning is not a central topic of investigation, but is a subsidiary factor, the utilization of which is induced from repetitions, corrections, pausal and other temporal measures (speech rate, etc.). Seliger (1978, 1980) places particular emphasis on the speaker's utterance planning and correction behavior (which he refers to as UPC), arguing that if second language production can be assumed to be "an attempt by the speaker...to arrive at the ideal utterance", then UPC can shed light on the speaker's plan (1980:88), amongst other things. He refers to two supposedly different types of L2 learner, those who have a "high degree of interaction and involvement with the language learning environment", and those who do not (as identified in Seliger 1977). In conversations between these speakers of ESL and native speakers, the former type

tended to produce many more corrections and repeats...[and] would often begin sentences before they had been completely planned out. (1980:92)

The latter type were cautious and correct. However, in this study Seliger provides only discussion of a series of examples, and does not provide quantitative evidence for his claim that there is "a preference for a particular style of UPC behavior among L2 learners" (89). As the accuracy of his division of L2 learners into two camps has been challenged by a replication study (Day 1984) which failed to support Seliger's findings, this study must merely be noted as a precursor to the slightly more substantial work of Dechert and colleagues, in particular that of Fathman (1980).

Fathman (1980) makes explicit use of Seliger's UPC line, in a study of the self-corrections and repetitions of Korean and Spanish child learners of ESL. Her sample was of 75 children between the ages of 8 and 11, interviewed (presumably by Fathman) for 15 minutes, during which time they were

asked a number of personal information questions and then asked to tell a story about a number of pictures. (78)

The children's repetitions mostly involved

repeats of one or two words followed by the completion of an utterance...usually...after the first or second function word of a constituent beginning an utterance. These repetitions probably allow the speaker time to plan for the next part of the utterance. The fact that they occur after a constituent...suggests...general and semantic planning have already taken place and that it is the exact lexical items which are still being decided upon during speech execution. (84)

Raupach (1980:14) describes a study involving the retelling of Bartlett's 'War of the Ghosts' tale by French speakers of German as a second language, and by German speakers of French as a second language, and notes that

the native speakers of French most commonly made indirect discourse depend on a single verb even when the quotation consisted of a lengthy utterance. The learners of French, however, with great regularity used a verb for every single statement. This result may indicate that the scope of planning and monitoring in the second language was limited compared with that of L1...More generally speaking, passages with a high processing load...led more easily to planning difficulties in L2 than in L1 productions.

Some speakers appeared to avoid areas of difficulty. This phenomenon has become accepted in the L2 literature, and Raupach makes the point that the utilization of avoidance strategies "presuppose[s] the anticipation of planning problems in the act of speaking" (15).

In a study comparing these pausal phenomena in L1 and L2 speakers Wiese (1984) notes (with regard to what elsewhere is referred to as co-planning):

In this study, as well as in a number of other studies (Dickerson, 1971; Deschamps, 1980; Hieke, 1981; Raupach, 1980)...L2 speakers gain needed planning time by employing all means of slowing down their speech: they have both longer and more pauses and they articulate more slowly. (20) The greater amount of planning time and greater number of corrections [of L2 speakers versus L1 speakers] are mainly caused by the lower degree of automatization, possibly during different stages of production. (22)

Möhle (1984) compared French speakers of German to German speakers of French with regard to pauses and errors. She attributes differences partly to the language training the two groups experienced, and partly to structural differences in the languages. In particular, with regard to French speakers of German, she refers to "the high quality of planning",

specifically "long-range macro-planning", as compared to problems with

the detail planning [which] can only be executed during frequent and long pauses on a step-by-step basis and thus leads to...short speech units...and a slow rate of speech. (36)

She explains this by way of

reports of French students that their schools and universities concentrate more on grammatical correctness than on fluent speaking in foreign language instruction. Communicatively disturbing pauses and drawls are the price they pay for being required to speak foreign languages "correctly". (36)

However, she admits that her explanations (like those of most of this group) are largely post hoc, and her imputation of differing degrees of planning to different aspects of discourse between Germans and French speakers are "an assumption for which no evidence is offered here" (37).

Some support for Butterworth's (1980a) position on planning comes from work done in this line by Lennon (1984). On the basis of an analysis of placement of pauses, repetitions and self-corrections in story retelling in English as an L2, he concludes that

The indications are that planning is conducted on at least two levels:

- a) Topic and overall syntactic structure are planned in advance chunks, ideally identical with the clause/statement breakdown of the passage. In practice, however, subjects are forced to break these units down still further...
- b) Planning at the level of lexical selection would appear to be on more of an ad-hoc basis. The self-corrections at this level would indicate the late stage at which this planning takes place. (67-8)

A final point of note in this line is given by Raupach's (1984) paper, which puts forward an interesting hypothesis to account for changes in L2 speakers' pausal phenomena towards native norms. His subjects are two adult German learners of French who answered the same set of questions in an interview with a native speaker of French, before and after a one-term period of study in France. Summarizing, he suggests that

[a]t a certain level of second language competence, most planning activities have to take place during unfilled pauses and in connection with standard pause fillers...[With development,] part of the planning activities that previously had been reserved for silent and filled pauses is now processed in connection with other..."islands of reliability"...new organizers [and] a preferred set of

formulaic schemata. (135)

The concept of "islands of reliability" was developed by Dechert (1983), who states that

[o]ne who sets out to plan and execute speech must try to anticipate and develop such islands. They may then become the basis for search processes necessary in the course of planning and executing speech. (184)

In short, this is an interesting line of work, somewhat isolated from both the mainstream of L1 language production and second language learning research. However, its utility for an understanding of planning is limited by (1) its researchers' failure to consider the limitations of pausal data as evidence for planning (see e.g. Beattie 1980), (2) the fact that their approach is principally descriptive and not oriented towards learning, and (3) because there is no attempt to manipulate or control planning.

## 2.5 Planning in SLA research

Almost no experimental research on this topic has been done which concerns SLA. The most prominent piece of work is Ellis (1987). It is conceived in terms of Ellis's 'Variable Competence' model of L2 learning and production (Ellis 1985a, b) which draws on work of Tarone (1982), Widdowson (1984) and Bialystok (1982). Those aspects of the model which are derived from Tarone's work are discussed in Section 3 in relation to monitoring; those which apply to planning are discussed here.

The aspect of the model most connected with planning is Ellis's division of learner's "capacity for language use" into "primary and secondary discourse and cognitive processes" (1985a:268). He states that the "primary discourse and cognitive processes" are "those responsible for engaging in unplanned discourse", and unanalysed and automatic "knowledge" is "actualized" to result in unplanned discourse. "Secondary" cognitive and discourse processes are those which result in planned discourse. An example of a "discourse process", he says, is the process of simplifying speech by omitting redundant elements; an example of a cognitive process is the process of eliminating elements in a message "for which no lexical item is available" in the speaker's interlanguage. (Very little evidence is provided for this generalization, and Ellis recognizes that "a more detailed analysis of the primary and secondary processes" is needed, along with a treatment of the role of input which would explain how "new rules" enter the system.)

The primary/secondary distinction is important to Ellis, because in his model

L2 performance is variable as a result of whether primary processes employing unanalysed L2 rules are utilized in planned discourse.



and

Development occurs as a result of

- a) acquisition of new L2 rules through participation in various types of discourse (i.e. new rules originate in the application of procedural knowledge);
- b) activation of L2 rules which initially exist in either a non-automatic unanalysed form or in an analysed form so they can be used in unplanned discourse. (Ellis 1985a:269)

Although these terms are not clearly defined, what Ellis seems to be saying is that interlanguage variability is central to language development, and that a major factor in inducing such variability is the application of such factors as planning. Specifically, it would seem to be via planning that procedural knowledge can be applied so as to result in new "non-automatic, unanalysed" rules. As a result of "activation" (left undefined) these rules become transformed to "analysed" forms and can be used in planned discourse. "Automatic" here refers to Bialystok's (1982) use of the term: "knowledge that can be retrieved easily and quickly is automatic" (Ellis 1985a: 267). It thus only refers to knowledge retrieval, and not to the performance of a language production system. Also, "analysed" refers to whether (or not) the learner has a "propositional mental representation" (Bialystok 1982:183) of the knowledge. The idea that the element of cognition which is most relevant to language performance is 'knowledge', (as in Ellis's model) probably derives from a general confusion over the concept of 'grammar' in the sense of a speaker's 'knowledge about the language', and whether this is implicated directly in speech production and comprehension (see e.g., Foss & Hakes 1978; Steinberg 1982 Ch. 4; Garrett 1986). Consequently, the few attempts by investigators of second language learning to develop psychologically non-naïve models, such as that of Bialystok, have looked to models of memory (Miller & Johnson-Laird 1976, in Bialystok's case) for a theoretical base, while ignoring studies of complex human behavior.

Since Ellis's work is only mentioned here insofar as it treats the matter of planning, this is not the place for a detailed critique. However, it should be noted that there are problems with Ellis's model. A general problem is that in attempting to deal with the cognitive processes of language learning and production, Ellis ignores almost all work on human cognitive capacities and their development. Instead he draws solely from a narrow section of the field of applied linguistics (the work of Tarone, Widdowson and Bialystok). Consequently his model appears somewhat unsophisticated. At a more specific level, problems arise particularly because (1) the concept of automaticity is applied solely to the retrieval of declarative knowledge rather than to the operation of the processes involved in utilizing a cognitive/psychomotor skill, and (2) the admittedly close relationship between planning and attention is

oversimplified to one of equivalence.

To turn now to the experimental work: Ellis (1987) had 17 adult learners of ESL first write a composition based on six pictures illustrating a story, for which an initial framing phrase 'one day...' was provided to induce use of past tense forms. Subjects had one hour to write their composition (Task 1). They were then asked to record two oral versions of the story, of which the second only was analysed (Task 2). Finally, a second set of six pictures was presented for two minutes, and subjects were asked to record an oral version of a story based on the set of pictures without further preparation (Task 3).

Subjects' productions were analyzed in terms of past tense forms: irregular, regular, and past copula. Collapsing data across all seventeen subjects, Ellis notes that

past tense verbs [show] a decrease in accuracy from Task 1 to Task 3. For the irregular past tense, accuracy levels remained more or less constant...for the past copula the accuracy levels on Tasks 1 and 2 were almost identical, but on Task 3 they were markedly lower.

While the methodology of this study can be criticized on a number of grounds, the general trend in the results is in line with earlier investigations, such as that of Danielewicz (1984). The main problem is conceptual, since Ellis refers to differences in use of the syntactic forms under consideration as "style-shifting", while at the same time making it quite clear that the differences have been induced by providing subjects with greater or lesser opportunities to plan. It seems that as in earlier work (Ellis 1982, 1985a, b) he wishes to equate planning or its effects with the concept of style-shifting (developed for SL studies by Tarone, e.g. 1982). There are problems with this (see section 3.2).

## 2.6 Summary

The evidence surveyed so far may be looked at in both a negative and a positive light. It is true that an argument for the importance of the concept of planning could not be made on the grounds of the depth of the knowledge we have of it with regard to SL learners. What we do have with regard to planning is the apparent breadth of utility of the concept. A diversity of groups of investigators both directly concerned with SL development, and in fields closely related to SL research have invested the concept of planning with significance in relation to SL development and production. The plan as used in native speaker speech production is taken as the basis of the assembly of an utterance, but is probably not accessible to consciousness. Then there is planning, as it is assumed to occur in the effortful speech of non-native speakers, which takes time and manifests itself in various ways in speakers' actual productions. There are the various planning-related activities which result in planned speech as opposed to unplanned speech, concerning whose

1

differences both broad-scale measures of clausal characteristics and fine-scale morphosyntactic measures have been used. And finally there is that planning which SL learners use with regard both to language use and other SL learning activities.

We cannot say unequivocally that planning helps SL learning. But it seems to be a ubiquitous concept where the use and development of cognitive skills are concerned, and we can say that there are theoretical and empirical reasons for paying much more attention to it than heretofore.

Given the breadth with which the term has been used by so diverse a collection of researchers, it seems too late to rationalize its use by legislating a narrow and specific definition here. It is to be hoped that future SL related use of the term will do so on an informed basis, making explicit in which of its many guises the term is currently appearing. Having dealt with the less thoroughly investigated member of planning and monitoring, and recognizing that a strong link, but not direct equivalence exists between the two, the more familiar term will now be considered.

### 3. Aspects of monitoring

#### 3.1 Introduction

A certain amount of confusion has developed concerning 'monitoring' in second language studies. Monitoring has been assumed to be equivalent to 'paying attention,' as it is in everyday speech. In this context, we often 'pay attention' to what we are doing, or saying, or hearing. But the term 'attention' is a technical term in psychological theories of human cognition, though unfortunately not one which has itself been carefully defined and unambiguously used. In addition, one writer on second language topics (Krashen, e.g. 1978) has used the term 'Monitor' with a specialized meaning in his writings. The following sections attempt to separate these usages.

The discussion has a core of two sections (3.2 & 3.3), each with two sub-sections. The reason for this sequence is that for each of the two mutually confounded terms attention and monitoring, there is (1) an interpretation leading to a narrow line of work in applied linguistics which has deficiencies, and (2) a more well-developed and empirically supportable interpretation used principally in psychology and psycholinguistics which can be used to inform and correct the former usage. First, research involving attention will be considered, on one hand in studies of interlanguage variation, and on the other in the wider world of psychology. Second, Krashen's narrow usage of the term monitoring will be outlined, and then the concept will be discussed in the context of more sophisticated recent developments in psycholinguistics and second language learning. A final section deals briefly with self-monitoring in terms of personality and culture.

#### 3.2 Attention and style shifting

The relationships between a speaker's choice, control, and exhibition of linguistic style (in the sense of 'formal' or 'informal') have become associated with the work of Labov (e.g., 1970). In work done prior to 1970 he and other sociolinguists (see Labov 1970:44) had documented aspects of native speakers' variable use of (in particular) phonological markers of formality or informality. In his 1970 paper Labov explicitly supported the intuitively appealing notion that speaking 'formally' requires greater attention to one's speech than speaking 'informally,' by referring to experiments done in which white noise was used to interfere with subjects' ability to "audiomonitor" (1970:46) their speech, with effects similar to those observed in his sociolinguistic studies.

An example of a first language investigation in this line is Jensen (1973), who examined the oral discourse of children. Her study compared selected features of "the casual and careful oral language styles of superior and average fifth grade boys and girls". (It was intended as a basis for recommendations regarding aspects of the language arts curriculum.) The

definitions of speech style used derive from Labov. Jensen states that

[a] more careful or formal speech style is associated with a mental set in which greater attention is paid to one's manner of speaking. Casual speech is more informal, spontaneous and relaxed. (341)

In her data collection conditions, pairs of subjects, "randomly matched by sex and intellectual level", were left alone in a room to discuss a problem concerning selection of animals for a zoo. Their discussions were recorded without their knowledge. Then the investigator entered the room, interviewed one of the children on the topic of zoos (the other child having been dismissed), and asked the child to present the results of the problem previously discussed. Jensen assumed that having a peer as a conversational partner (without any apparent observations by adults) would induce casual style speech, and that the subsequent replacement of the child by an adult, and a formal request to answer questions and report, would induce careful speech.

The results of interest here are:

- 1) "casual style" showed a significantly higher degree of lexical diversity (measured by average type-token ratio per 100-word segment);
- 2) significant differences in favor of "careful style" discourse were found in all three of Jensen's measures of structural complexity (words per communication unit [Loban 1966], clause length, and subordination ratio);
- 3) "a significantly greater variety of syntactic patterns was observed within the casual language style";
- 4) a composite measure of standard English usage showed a significantly greater incidence of non-standard speech under the "careful style" condition.

With regard to the latter point, Jensen does not provide sufficient details to determine whether "non-standard" in this context separated BVE usages from other "errors", but she does state

the closest approximation of standard usage in every category investigated occurred when the subjects spoke to each other within the casual speech setting. (349)

In second language work, one of the more prominent researchers using the concept of attention has been Tarone (1979, 1982, 1983, 1984). Tarone (1983:154-5) predicted that when more attention is directed to language form (i.e. in 'formal' situations), learners' IL will be more "permeable to" both TL and L1 forms, but when less attention is paid to form (in 'informal' situations) IL will show less TL (and other) influence. These predictions, as they apply to IL phonology, were examined by Sato (1985), in a long-term case study of a Vietnamese boy acquiring English. Sato operationalized styles in terms of communicative tasks: "spontaneous conversation, oral reading, structured

interview, elicited intuition, elicited imitation", to test Tarone's prediction that

acquisition of TL forms should take place first in speech produced on more formal tasks. (1985:183)

Sato examined acquisition of phonology in several domains. When word-final consonants were considered, it was in the 'vernacular style' task, conversation, that there was a greater incidence of TL-like production. (In other respects, too, the complex pattern of results failed to conform to the predictions of Tarone's model.) Sato concluded that it is not just attention paid to language form, but also the attentional demands of other aspects of the task: "recall and encoding of rhetorical structure, lexical items, clause sequencing etc." which must additionally be taken into account. That is, psycholinguistic, not just sociolinguistic, dimensions of performance must be considered. An earlier investigation (Oyama 1976) into the IL phonology of Italian immigrants to the U.S. also compared performance in casual speech and on an oral reading, and found more TL-like pronunciation on the informal speech sample than on the reading:

the casual samples...showed less accent than the Paragraph readings. This is contrary to the expectation, derived from Labov's writings, that casual speech would be farther from the norm than formal. (268)

Oyama speculates that this result may have been due to the comparatively stressful nature of the oral reading task compared with the task requiring an informal, personal narrative, given the nature of her subjects. (See also Nutter 1982, discussed in Section 3.5.) Oyama does not consider the possibility that the cognitive demands of the oral reading task might just have been greater, particularly for less proficient subjects, but she does note that

the increased attention to pronunciation that presumably accompanied the reading of the Paragraph did not necessarily allow closer approximation of the norm. For those whose command of English phonology was shaky, increased attention seemed to have a deteriorative effect on performance. This recalls the Yerkes-Dodson law...which states that high motivation...may hinder performance on difficult [tasks]. (270)

Tarone's (1983) predictions were also not supported by the results of her 1984 study. In this investigation, Tarone found that the speaker produces most TL-like variants in performance on tasks which elicit informal speech (the vernacular speech style), despite the fact that this is the style in which least attention is supposed to be paid to language form. (The result was explained by reference to discoursal phenomena.)

Throughout these studies, no evidence was presented to support the assumption that a speaker using, say, 'vernacular' or 'informal' style, was not paying attention to his/her language,

or that 'attention to language' and 'formality' are the same. Tarone had relied on Labov (1970), who says

we find that styles can be ranged along a single dimension, measured by the amount of attention paid to speech. [Labov footnote] The most important way in which this attention is exerted is in audio-monitoring one's own speech...This axiom (really an hypothesis) [has] strong support... (1970:46)

At this point, Labov's footnote refers to

experiments with white noise which eliminate audiomonitoring show much the same kind of style shift that we observe when attention to speech is distracted by other means.

It is interesting that Labov does not reference these experiments (though he did in later work: Labov 1972). In fact, they constitute a single study by Mahl (1972). As part of this study, Labov was a consultant, concerned with just one of Mahl's subjects. Perhaps this is why Labov refers to "this axiom (really an hypothesis)"! Mahl had received "the impression that six [of seventeen] subjects sounded 'less cultivated'" (227) under his experimental conditions. Labov was called in to support Mahl's observations of speech. He examined the speech of only one subject, "American-born of Italian immigrants" with reference to use of /t/ versus /th/, and /d/ versus /dh/. He confirmed Mahl's impression by documenting the fact that the subject used a greater proportion of lower-class forms when white noise prevented the subject from hearing his own speech. Mahl actually had four experimental conditions:  $\pm$  facing experimenter,  $\pm$  white noise. In conditions of no noise but no visual contact with experimenter, the lower-class forms also increased. Noting this, Mahl suggests that a more refined analysis of the tape might display other interesting effects. Something of this sort was eventually done by Bell (1984), who, in the course of a longer work on style, reanalyzed the data reported by Mahl for this subject, to show that the effect for noise was not consistent across both /th/ and /dh/, and that loss of visual contact had a greater effect than presence of noise in some conditions. He states

[o]ur reanalysis shows that in Mahl's experiment, loss of oral monitoring is on balance less important than the loss of visual attention to the person of the interviewer. (149)

Having further examined little-known German research on manipulation of attention (Dressler 1974; Vanecek & Dressler 1975, cited in Bell) and more recent work on style shifting (Gal 1978, Rickford 1979, Coupland 1980, Bell 1982) Bell concludes that

[a]ttention is a mechanism, through which other factors can affect style. Certain topics or addressees or settings tend to evoke graded degrees of attention which may result in parallel graded styles. But the behavioral results of a

given level of attention can be quite diverse. Speakers can turn deliberate attention to producing any style (Coupland 1981). Attention is at most a mechanism of response intervening between a situation and a style. (1984:150)

The latter point seems intuitively obvious. Take, for example, the (hypothetical) case of a classroom learner of Japanese as a second language (JSL). He may have a good command of the formal system (since that is what is taught in most JSL classes), and have it 'fully automatized'. Might it not be that he has to pay more attention to the form of his output when in a casual social situation where the use of formal language would be inappropriate, so that he has to use the informal language with which he is less familiar?

Tarone's most recent work has recognized some of these problems (Tarone 1987). Parrish, Tarone & Taghavi (1986) present a reanalysis of the data of Tarone (1984), and conclude that rather than style, task demands (as Sato had observed) and the nature of the discourse required are two important variables (of an undelimited set) which predict accuracy levels of IL forms.

### 3.2.1 Attention in the information-processing model

In the second usage mentioned at the outset of section 3, 'attention' is tacitly taken to be equivalent to 'processing resources', within a standard information-processing model (see e.g. Bower 1975; and Dodd & White 1980, for a consensus view) where there is a central, fixed quantity of processing capacity available to conduct operations. As Estes (1978:274) says, "the notion of capacity limitation is inherent in the information-processing analogy".[5] In standard versions of this model, attention is thought of as being under the control of a 'central processing unit' which allocates resources to jobs.

Attention...involves a selection of information [which] is often related to Central Processor control; i.e., depending on specific goals and plans, certain information will be selected and other information rejected. (Dodd & White 1980:17)

Attention [is] a processing resource [whose] allocation is assumed to be under some level of cognitive control.  
(Wickens 1980:240)

Thus, for language production, attentional resources could be assigned to the preliminary stages of message formulation, i.e. planning, or to the later stages, i.e. execution and monitoring. In the second usage, attention is thought of more as equivalent to 'attending': a strategy, or an allocation of effort (Wickens 1984:63) whereby a conscious decision is taken to attend to, or monitor, the output stream of speech. This can be interpreted to mean that the stream of speech will not only be monitored, but action will also be taken if it does not comply with some model presumably constructed, or planned, either before speech began or concurrent with it. (See Section 3.4.)



### 3.2.2 Problems with attention

#### 3.2.2.1 Problems with the concept of attention

The potential of attentional resource theory to explain IL variation is limited by the considerable extent of disagreement between attention theorists, and by the swiftly changing situation in information-processing theory as a whole. Thus, whereas the basic information-processing model assumes (or assumed) a central, fixed capacity pool of resources, more recent work (reviewed by Kahneman & Treisman 1984) has established that

divided attention is possible and that interference is reduced or eliminated when concurrent tasks differ sufficiently from one another...thus speech and music, or auditory and visual words, can more easily be processed in parallel than two auditory or two visual messages of the same type. These observations suggest that the brain is organized as a modular system, and that interference arises chiefly within rather than between the separate, semi-independent subsystems...Whether there is in addition some central shared resource or limit...remains an open question. (Kahneman & Treisman 1984:33)

In addition, work using considerably different experimental arrangements (typically visual search) has demonstrated that humans have

a rather impressive ability to process multiple stimuli [emphasis supplied] even in the same modality and of the same type. (*ibid.*:34)

This has led to the idea that there is a type of information processing which requires no resources -- is totally automatic (e.g. Schneider & Shiffrin 1977).

Recently, one of the researchers most influential in establishing the case for the possibility of 'divided resources' has questioned the validity of the entire concept of 'resource theory' within information-processing models on both experimental, methodological and conceptual grounds (Navon 1985; see also Neumann 1987 for a recent critique).

#### 3.2.2.2 Problems with the information-processing model

Attention has been initially conceived in terms of the information-processing model. The observation has been made (Estes 1978) that this model is a confluence of metaphors and methods. In stronger terms, Kolers & Smythe (1984:291) state

Many models in cognitive psychology...are only operationally unrealizable fictions, loose applications to cognition of a successful computational metaphor.

In discussing the utilization of such models in the study of language, Reilly (1985) argues that this metaphorical looseness has prevented the theory from being adequately tested and has encouraged a piecemeal approach to problems, with the consequence that research has been insufficiently cumulative.

Although this may have prevented the whole theory from being refuted, perhaps the looseness has permitted one identified area of weakness and set of anomalous results to cause substantial change throughout the model, rather than being ignored (as is often the case when anomalous results are encountered in the context of a well-established theory -- see Greenwald, Leippe, Pratkanis & Baumgartner 1986). Specifically, a number of aspects of cognitive activity (including language processing) appear to involve, rather than a sequence of discrete steps of processing, simultaneous activity in different domains, which mutually interact in determining the final outcome. This has led to the development of models which involve a network of simple processing units all mutually interconnected, where the acquisition of connection strengths plays a large part in determining outcomes. Proponents of such models argue that they are better able to account for data which indicate mutual constraints on and interaction of cognitive processes. One of the most prominent models is the Parallel Distributed Processing (PDP) model (Rumelhart, McLelland & the PDP Research Group 1986). Additional support for such models has come from the fact that by comparison with the earlier standard model they take into more careful account the nature of the neurological system (Pribram 1985).

All this is not to suggest that SL researchers should discard the information-processing model. On the contrary, it is the most well-established model of cognition we have. But SL researchers should be wary of placing too much trust in the concept of attention, and should be particularly careful with regard to what they intend when they use the term, in the current circumstances.

### 3.3 Monitoring

#### 3.3.1 Monitoring as a second language strategy

This aspect of monitoring appears in the work of Naiman, Fröhlich, Stern & Todesco (1978). On the basis of interviews with 34 "good language learners" (GLLs), Naiman et al. identified five strategies that these successful individuals engaged in, one of which was "monitoring of L2 performance" (1978:14).

GLLs constantly revise their L2 systems. They monitor the language they are acquiring by testing their inferences (guesses); by looking for needed adjustments as they learn new material or by asking native informants when they think corrections are needed.

Naiman et al. use the term 'monitoring' to refer to the

monitoring of the state of a system, rather than of a particular performance -- somewhat different from how the term has come to be understood in SL work. This is perhaps because the second part of their study was an unsuccessful attempt to observe such strategies in action in SL classrooms, so that their line of research was not followed up closely at the time. Their use of the term was also probably overshadowed by that of Krashen (see next sub-section). Note that one difference between Naiman *et al.*'s usage is that it incorporates the learner's concern with others' language, as well as his/her own. This sense of the term has not been widely explored in the SLA literature, but is used by Morrison & Low (1983), and MacWhinney & Anderson (1986). It may be that this aspect of monitoring, possibly as a prerequisite to "noticing" (Schmidt & Frota 1986, see Section 4.2) is also important for SL learning.

### 3.3.2 The distraction of Monitoring

#### 3.3.2.1 Krashen's position

The concept of monitoring was made prominent in what became the mainstream of second language research by Krashen (1976). He used it as a way of accounting for Larsen-Freeman's (1975) failure to replicate fully the findings of Krashen and his associates (e.g. Bailey, Madden & Krashen 1974) concerning a 'natural order' in the acquisition of a small set of grammatical functors by adult SL learners using a test designed for children. In Krashen's early work, the 'Monitor' was conscious knowledge of grammar rules, capable of being applied to language production and comprehension in certain circumstances -- mainly when doing non-speeded language tasks in which the subject can focus on the form of the message. Although this would *prima facie* suggest that the 'natural order' would not be observed in data collected through the process of writing (as Larsen-Freeman 1975 found), Andersen (1976) and Krashen, Butler, Birnbaum & Robertson (1978) did find such an order in data derived from written compositions of ESL learners, even (as in the latter study) when learners had been asked to edit their papers. This finding is explained by Krashen by saying that in this case learners were not 'focusing on form' (even though they were apparently encouraged to do so), and it is only in discrete point tests of written English (as used by Larsen-Freeman, and in a subsequent replication by Krashen, Houck & Robertson, cited in Krashen 1978) that the Monitor can be used.

The closeness of Krashen's original conception to ordinary language usage probably led to its swift entry into the consciousness of the relatively small number of investigators concerned with SLA in the middle 1970s. Interest in this topic resulted subsequently in a large number of studies in this area, though comparatively little insight into the underlying issues emerged. However, investigators have gradually become aware of limitations in the original methodology of early 'morpheme studies', both those apparently supporting Krashen's position and those (e.g. Rosansky 1976) opposing it.

As Krashen refined his conception of SL 'learning', he decreased the importance of the Monitor, and noted aspects of second language performance which would come under an ordinary language use of the term 'monitoring' (no capitalization), but did not apply to 'the Monitor'. SL learners might "self-correct using acquired knowledge of language, or our "feel" for grammaticality" (Krashen 1981:4). But, in addition to the two restrictions mentioned above, in order to use the Monitor, the SL learner must "know the rule...he or she needs to have a correct mental representation of the rule to apply it correctly" (1981:3). Since, as Krashen observed, linguists have not described large areas of English (let alone other languages), this was a very demanding requirement. The admission that there could be 'monitoring' which was not 'Monitoring' was indicative of conceptual problems in the development of Krashen's views.

### 3.3.2.2 Criticisms of Krashen's Monitor

This is not the place for a detailed discussion of Krashen's work. Some of the more well-founded rebuttals can be briefly summarized here (but see also Barash, forthcoming, and McLaughlin 1987).

An early and influential critique of Krashen's position (McLaughlin 1978) argues that Krashen's central acquisition-learning distinction was really a restatement in new terms of subjective phenomena which can more parsimoniously be explained in terms of the pre-existing concepts of schema and information-processing theory. In addition, McLaughlin provides a convincing demonstration that much of Krashen's evidence is weak or non-existent. Morrison & Low (1983) demonstrate the conceptual limitations of Krashen's version of 'Monitoring' and particularly emphasize its lack of connection with earlier, more rigorous uses in language processing models (e.g. Laver 1970), and the trivializing effect that the work of Krashen and his followers has had on this important concept.

In one of the most rigorous SL investigations related to the topic of monitoring, Hulstijn & Hulstijn (1984) were unable to apply Krashen's 'Monitor' in their analysis of the effects of time and focus on form on SL grammatical intuitions, because they found no way to distinguish "self-correction on the basis of the acquired system from self-correction on the basis of the learned system" -- the latter being 'Monitoring.' They observe (1984:41) that

[a]s long as Monitor theory remains unable to empirically isolate the acquired system from the learned system, while continuing to claim that they are totally separate, Monitor Theory may well remain unaffected by some empirical data.

Further criticism has been made by Gregg (1984; forthcoming). As well as providing some counter-evidence to Krashen's claim that the Monitor can be used (to a limited

degree) in production but not at all in comprehension, he focuses attention on Krashen's remark that

for most people, even university students, it takes a real discrete-point grammar-type test to meet all three conditions for Monitor use. (Krashen 1982:18)

As Gregg points out, this is tantamount to saying Krashen's Monitor can not be used under the normal circumstances of second language learning. If Krashen is right about the applicability of the 'Monitor', it would seem that his narrowly drawn conceptualization of monitoring has little relevance to SL development.

### 3.4 Processing approaches to monitoring

Contemporaneous with the debate described in the preceding section, a considerable amount of empirical research has been going on concerning first and second language use and development, most of it couched in terms of some form of information-processing model of language production.[6]

First language work has often been conceptually and methodologically advanced compared to second language research, and the area of language processing models is no exception. The number and sophistication of models has increased, and initial attempts to overcome what is perceived as a major weakness of the information-processing model, its seriality, have been made. Almost all contemporary psycholinguistic models of speech production address the fact that speakers have varying degrees of control over their language at different stages of its production. Levelt (1983) describes at least two conceptions of this in circulation. If the speaker has direct access to the components of the production process, s/he may in some sense respond to internal "alarm signals." Levelt refers to this as "the production theory of monitoring" (1983:46). Alternatively, some investigators assume that the speaker only has access to the final result of the production process, and in this the speaker is able to

detect any structural deviances which he might as well have detected in somebody else's speech, and he can moreover compare the derived message with his original intention.(46)

This is the "perceptual theory of monitoring." Although Levelt says "there is not yet sufficient evidence to make an informed choice between these two alternatives," he inclines to the latter of the two positions, on the grounds that it is both more parsimonious, and more importantly, were it otherwise, language production would be different from all other cognitive processes. This position is supported by Bock's (1982) review of sentence formulation research, which suggests that the speaker has no access to intermediate processing results (as anyway might have been suggested by the rapidity and parallel nature of the processes involved). Levelt conceives the monitor (following the

view of Laver 1973, 1980) to be a component of the speech processing system which

compares parsed aspects of inner and outer speech with (i) the intentions, and the message sent to the formulator, and (ii) criteria or standards of production...[It] has to do with the detection of speech errors, syntactic flaws, etc., but also standards of rate, loudness, and other prosodic aspects of speech. (1983:50)

It also has the function of making the speaker aware of production problems. More recently, however, with the development of a number of different systems, terms have proliferated. Berg (1986a) provides the example of 'monitors' in Shattuck-Hufnagel's model (1979) which both disallow elements and replace them by others in speech production. This, he points out, is the function of 'editors' in other models (such as that of Motley, Baars, & Camden, 1983). But since the status and existence of editors in speech processing models is by no means accepted, this is not a mere "terminological quibble" (1986a:134). Berg suggests that for clarity's sake, a distinction should be made between the processes of (1) observing "utterance planning", (2) vetoing material prepared for speech, and (3) replacing vetoed items by more preferable material. These processes he would define as monitoring, filtering, and editing, respectively.

Berg goes on to argue against models of speech production which contain separate editors, for the theoretical reason that they are required to be very powerful units with "homunculus-like qualities" (143). (Similar arguments are advanced by Stemberger 1985:144-5.) Berg suggests that the data which they have been introduced to deal with can equally well be accounted for if an interactive activation model of language processing is posited. Such a model would follow the design for general cognitive processing put forward by McClelland & Rumelhart (1981, McClelland, Rumelhart & Hinton 1986). In such a "parallel distributed processing" (PDP) system, sub-units of the system are highly mutually interactive, so monitoring in a sense happens of its own accord. That is, there is no need to suppose the existence of a separate unit which checks either the output of substages of production, or the final result, because such a process is inherent in the structure of the system. An interactive activation system calls for a bidirectional spread of information through the system, in which a mismatch between communicative intent and utterance would automatically call for the possibility of a cut-off and correct re-running (see Berg 1986b).

The work of Hulstijn (Hulstijn & Hulstijn 1984) provides a bridge between the concepts discussed in the preceding section, and the recent, more sophisticated work on monitoring (in L1), since as mentioned above, it did consider Krashen's early conception of a 'Monitor.' Hulstijn had adult SL learners of Dutch retell a number of 'stories' of about four sentences in

length, which were presented to them in written form. First of all, Hulstijn established that subjects could effectively respond to directions and feedback to place the focus of their attention on the informational accuracy of their retellings. When "requested to focus on the grammatical correctness of ... responses" (Hulstijn & Hulstijn 1984:31), subjects were able to significantly increase the percentage of correct realizations of two Dutch word-order rules. In addition,

focus of attention on grammar had the same significant positive impact on...performance for learners who could correctly verbalize these rules [for word-order], for learners who could not state any explicit rule at all, and for learners who stated partly correct, or even incorrect rules. (1984:40)

This is an encouraging finding for second language researchers who wish to locate their work within the mainstream of scientific research: that despite the clouding of the conceptual waters by Krashen, the broader conception of monitoring, which would seem to be an obvious part of all skilled cognitive activity, does have a positive influence on second language behavior. (The Hulstijns' finding that conscious rule knowledge makes no difference is supported elsewhere, e.g. Grigg 1986, Seliger 1979.)

### 3.5 Personality traits, culture, and monitoring

A final aspect of monitoring which must be noted for the sake of completeness is that which considers monitoring as an aspect of personality or culture. Krashen (e.g. Krashen 1978:10-11, Krashen & Pon, 1975) has suggested that some learners are Monitor "over-users," and others are Monitor "under-users":

The Monitor "over-user" monitors all the time, and as a result exhibits little fluency. (Krashen 1978:10)

One attempt to provide a rationale for this assertion was that of Beebe (1983), who interpreted Monitor under- and over-users in terms of risk-takers and risk-avoiders, respectively. She points out, however, that "the literature shows that individuals do not have a fixed risk-taking propensity" (48), that is to say, the situation will determine whether or not risks are taken, and whether or not Monitoring takes place.

It is sometimes also suggested in general discussion that some cultures, or culture-specific language teaching practices, produce a greater proportion of Monitor "over-users" than others. The idea gains some strength from the line of research in social psychology on self-monitoring, associated particularly with the name of Snyder (1974, 1979, 1987). Snyder has developed a model of the high self-monitor as one who uses information from others

as guidelines for monitoring (that is, regulating and controlling) his or her own verbal and nonverbal self

presentation. (1979:89)

Low self-monitors, on the other hand, are controlled from within.

This model has been proposed to explain differences in conversational patterns (Ickes & Barnes 1977). However, contradictory results have been obtained (Dabbs, Evans, Hopper & Purvis 1980), and Allen (1986:1) observes that "research has failed to consistently validate Snyder's self-monitoring construct". Allen (1986) expresses uncertainty as to whether self-monitoring is indeed a personality trait, and questions the reliability of the scales used to measure it. The suggestions mentioned above concerning culture-specificity of monitoring often refer to the Japanese as typically high self-monitors. There is as yet no SL-related evidence for this. Snyder (1987:11) interprets comments by Benedict (1946) to the effect that the Japanese are high self-monitors, and this appears to be his sole support for cultural differences. However, Benedict's work (done during World War 2 in the U.S., solely from documentary sources) is no longer considered an accurate depiction of Japanese society (K. Watson-Gegeo, p.c.), and Snyder's position appears contradicted in a recent study (Gudykunst, Yang & Nishida 1987). It seems unlikely that this aspect of monitoring will be of use to second language researchers in its present form. A response could be made that although self-monitoring may not be a generally existing personality trait, some people may tend more to monitor their speech than others. This may indeed be so, but it then is merely a matter of individual differences, not a stable, measurable trait which must be controlled for in experimental work, or incorporated in conceptual models.

However, there is an interesting study by Nutter (1982) which suggests that class cultural differences may result in differential speech performance when there is pressure to attend to form. A group of 32 ninth and twelfth grade students (adolescents), made up of equal sections by sex and SES (low/high), were interviewed. Half of them were given a test of English usage, and instructions to speak as "correctly" as possible. The other half were given the impression that the interviewer was interested in their ideas, not their speech. When results were analysed by sex and SES, all groups were found to speak more (measured in number of words), and use more complex language (length of T-unit, number of nominal constructions per T-unit, number of adverbial constructions per T-unit) under pressure to be "correct", except low SES males, who reacted in the opposite manner, by saying less, and using shorter utterances. All of Nutter's subjects were adolescents. It would be interesting to see if this pattern would hold up for adults, or when culture was defined in national rather than class terms. A replication for SL speakers is perhaps called for.



### 3.6 The story so far

Most of the literature surveyed in sections 2 and 3 has concerned descriptions of planning and monitoring in static systems. To summarize briefly Section 2 -- the position was taken that planning is a widespread aspect of human cognition. Preliminary descriptions of differences between planned and unplanned speech have been considered. Planning is thought by many researchers to be inherent in L1 and L2 speech production systems. Planning can be considered as first, one of a number of factors determining characteristics of speech, and second, as something which SL speakers utilize in dealing with the demands of production. O'Malley et al. (1985) clearly see it as something which can contribute to an improvement in SL performance, and the work of Ellis (1985a, b, 1987), though it has some conceptual problems, seems to support this.

In Section 3 it was seen how early sociolinguistic research viewed monitoring as something which results in the selection of one linguistic system rather than another (though given the foundations of that line of research as discussed in Section 2 the position would seem to need renewed investigation). Problems concerning the use of attention in information-processing models, and in Krashen's work were identified. A sketch was provided of some promising investigations into monitoring in current first language research -- though it must be remembered that this research is attempting to provide a description of the native speaker's fully developed language system. In L2 research, however, Hulstijn's work does show how monitoring can result in SL learners making in some sense 'better' use of their available resources.

The implications of this possibility must be considered next. How do planning and monitoring contribute to SL development?

## 4. Conclusions

### 4.1 The problem

If studies of planning and monitoring remained at the level of static description, they would have relatively little to offer the investigator of second language learning. The underlying reason to examine these two related topics is the suggestion that if second language learners can use their existing IL system 'better' they may progress, or the less cautious assumption that if they are using it better they are progressing. Investigators are concerned with what Weinreich, Labov & Hertzog (1968) called "the transition problem":

Change takes place (1) as a speaker learns an alternate form, (2) during the time that the two forms exist in contact within his competence, and (3) when one of the forms becomes obsolete. (184)

The question is, how are monitoring and planning involved in these three stages of SL development?

### 4.2 The role of monitoring alone

One benefit of Krashen's position concerning the unconscious nature of SL learning and thus the irrelevance of monitoring (as he defines it), has been to stimulate some serious (though scattered) discussion of this topic as it relates to SL development. Morrison & Low (1983) call for a more complex description of 'monitoring,' which would at least recognize that there may be several types of monitoring. They suggest that when a speaker is monitoring his/her own speech, s/he may be doing pre-articulatory and/or post-articulatory monitoring. The former, they say, may simply result in hesitant speech, whereas the latter may lead to "overt editing" (Hockett 1967:936) in the form of, for example, false starts and self-corrections. (See also Levelt 1983, and Section 2.4 above.) Morrison & Low (1983:241) also argue that monitoring one's own speech involves very similar mechanisms to monitoring that of others:

[i]n both situations, an abstract image held in the working memory store is analysed on the basis of stored information.

(See also MacWhinney & Anderson 1986:18.) Morrison & Low provide some discussion of the possibility that under favorable circumstances, speakers' monitoring of each others' utterances may aid communication, and additionally hypothesize (1983:244) that

the act of detecting and subsequently repairing certain mistakes may have longitudinal repercussions.

Schmidt & Frota (1986) considered the latter hypothesis, but found no evidence in their data, collected on an adult learner of Portuguese as a SL (Schmidt), that features which were self-

corrected (over a six-month period) were those which improved. This evidence would apply to post-articulatory monitoring only, of course.

If monitoring can be considered to apply to others' speech as well as one's own, other aspects of Schmidt's work (Schmidt & Frota 1986) are relevant. First, it provides further evidence that learners do monitor their own productions. If the learner monitors his/her own SL speech, an utterance produced successfully (in some sense) on one occasion may be noted and reused thereafter, being run off from memory or in an automatic fashion:

We have found that R [Schmidt] repeated himself almost constantly when beginning to learn Portuguese, not only within clauses and phrases but also by retelling stories in almost the same words and by relying repeatedly on the same constructions, some nativelike and some not...Especially when errors are idiosyncratic, it seems unlikely that the cognitive organizer has somehow repeatedly worked through a problem and repeatedly arrived at the same solution. When R said antes de X anos for the fifth time, we doubt that he had just created it for the fifth time. He simply remembered it. (1986:310)

The same position is taken by Bahns, Burmeister & Vogel (1986:721). Their data on children's learning of English as a SL contains a number of examples of idiosyncratic, non-nativelike utterances which the children used repeatedly. (See also Schmidt, 1988.)

The second aspect of Schmidt's work of relevance to monitoring relates to the idea (Krashen 1983) that a SL learner may 'notice the gap':

in the particular case of a nontargetlike form i and a targetlike form i + 1 a second language learner will begin to acquire the targetlike form if and only if it is present in comprehended input and "noticed" in the normal sense of the word. (Schmidt & Frota 1986:311)

That is, an important aspect of Schmidt's learning involved becoming conscious of differences between his output and that of native speakers. Schmidt & Frota summarize the basis for this hypothesis under three headings: (1) of 14 verbal constructions both taught and present in informal input, the 4 which were not learned by Schmidt were those he did not notice in the linguistic environment; (2) of the many possible aspects of the verb phrase present in informal input, only one item could be shown to have been learned which had not also been taught in the classroom setting; (3) corrective feedback from native speakers which was couched in potentially non-overt forms, and was thus not perceived as a direct correction, had no effect on Schmidt's Portuguese.

The question then arises: how does noticing take place? Noticing is presumably not possible unless there is some processing of the stimulus. The SL literature has not given much consideration to the earliest stages in such a process. However, Chaudron (1983, 1985) has developed Corder's (1967) intake/input distinction by delineating a possible range of stages from initial reception to subsequent acquisition of linguistic forms, in which the earliest stage is "preliminary intake" (Chaudron 1983:438). When an item has previously been presented (either in class or outside) explicitly or in isolation, it could be said that, after preliminary (or "piecemeal" processing -- Fiske 1986) an initial schema for it may have been developed in the learner's cognitive system, which would facilitate picking the item out of the surrounding linguistic environment subsequently, even if the learner's IL at the same time also contained a non-targetlike version of the item.

L1 work concerning plans can provide a few suggestions concerning "noticing". In a discussion of situations where humans have a developed plan for behavior, Randall (1987:48) notes that

people regularly classify certain items of unusual situations as "relevant" and may select an unusual routine even though they made no conscious attempt to acquire the information.

Randall also refers to related ethnographic work on planning and routines (Gladwin & Murtaugh 1980). These field studies suggest that human beings have an "out-of-awareness processing mechanism for monitoring the state of rarely changing but situationally important variables", which may be based on what Neisser (1967) refers to as "pre-attentive awareness".

An alternative conceptualization of 'notice the gap' might be in terms of "violated expectations" (Hayes-Roth, Klahr & Mostow 1981). If a learner had a non-targetlike form *i* in his/her IL and encountered a different (*i* + 1) form in a linguistic context where s/he expected to find *i*, then violated expectations would lead to learning.

However, this does not explain the cases Schmidt & Frota refer to where even though items had been taught in class, and were present in input, they were not noticed by Schmidt, and not learned. Schmidt & Frota observe that there are constraints on perceptibility, but at present it is difficult to specify them in other than elementary terms (e.g. "big" things first, gradually progressing to details). On the other hand, they argue (on the basis of Miller & Johnson-Laird's (1976) model of language and perception that "we do have some control over the features we attend to" (315), so leaving open the question of why some linguistic items which should have had initial schemata as a result of being taught were not noticed in the environment by Schmidt.

#### 4.3 Skill learning, planning and monitoring, and SL development

Monitoring and planning have closely connected roles in the carrying out of complex behavior (Hayes 1981, De Lisi 1987:93, Scholnick & Friedman 1987:5, 24-29). Prima facie, the more complex unfamiliar behavior is, the more important monitoring is for it to be carried out successfully, and the more likely that some form of planning will be needed in the initial phases or occasions of use.

The close connection between monitoring and planning with regard to SL development is mentioned by Faerch & Kasper (1983:28), and McLaughlin, Rossman & McLeod (1983). The latter refer to "controlled processes" being used in the initial stages of SL learning, at which time attention and "cognitive effort" (145) must be expended in carrying out language production. That is to say, at this stage the learner may both pre-plan an utterance and monitor its execution. The relationship becomes perhaps easiest to conceptualize when SL learning is thought of in terms of the development of the ability to carry out a complex task which has both cognitive and psychomotor aspects. Descriptions of the native speaker's language production system make it obvious that producing or comprehending speech is a complex task which involves many substages. As Levelt (1978) says,

[a] task is complex if it requires the execution of a variety of operations in accurate temporal integration...If a person is able to execute a complex task well, he is said to have skill. (54-55)

In particular, speaking is typical of complex tasks in that it has a hierarchical structure, which necessitates the existence of plans or programs for the execution of an utterance. A detailed analysis of what can be classified as a skill is provided by Downing & Leong (1982), and summarized in Downing (1984), who gives a twenty-heading list of skill characteristics. Researchers in this area do not hesitate to include language use as an exemplar of a cognitive skill. (See also discussion in McLaughlin, Rossman & McLeod 1983, McLaughlin 1987.)

The work of investigators of skill learning also provides a much clearer treatment of the distinction Bialystok (1978, 1979) has made between "analysed" (or "explicit") and "unanalysed" (or "implicit") knowledge. It has long been recognized that there is a difference between knowing 'what' and knowing 'how' -- the main difference being in the accessibility of this knowledge to consciousness. Skill learning theorists (e.g. Fitts 1964) treat this explicitly, recognizing that many skills pass through an early stage in which knowledge relating to what is to be performed is available to the learner in an explicit, 'declarative' mode, and only later becomes fully internalized, as 'procedural' knowledge.[7]

Recent developments make this conception a potentially

valuable one for future research into SL development. After the heavy emphasis on learning in psychology throughout the behaviorist period, cognitive psychology had focused on the description of existing cognitive structures and skills (Andre & Phye 1986). It is only in the last few years that psychologists have begun to develop a cognitive theory of learning, and specifically one which applies to cognitive skills. Anderson and associates (e.g. Anderson 1981) have developed a general model to describe and make predictions concerning the learning of cognitive skills, regardless of domain. (For a recent SL-related exposition, see O'Malley, Chamot & Walker 1987.) A major feature of Anderson's model is the use of 'production systems' to describe rule-governed cognitive behavior (including language 'rules'). This simple formalism provides the means and a requirement whereby all steps in the description of a complex cognitive process must be made explicit. A proposed system (which constitutes a formal representation of Levelt's plans, see below) can be run as a computer program and checked thereby. Of particular importance is that Anderson's model also provides a mechanism for describing the collapsing, or 'compiling' of production systems (governed by rules relating to the number of times a subsystem has been successfully utilized) to simulate the real life development of automaticity through repeated running-off of production systems. As Levelt has said, the acquisition of skill in the performance of speech, as with any other skill, "consists essentially of automation of low level plans or units of activity" (1978:57; and see also McLeod & McLaughlin 1986 on compilation). Empirical support for Anderson's model is particularly clear with respect to the effects of practice: simulations involving the repeated running-off of production systems with specified compilation rules produce success curves closely approximating the log-linear function widely found to characterize human skill learning (Neves & Anderson 1981; Newell & Rosenbloom 1981). A preliminary attempt has been made to apply this kind of model to learning a first language by MacWhinney & Anderson (1986), though limitations of the linguistic analysis used prevent Anderson's model from being given a good test in this instance.

The importance of practice effects in a skill-learning model of SL development also allows a role for planning. Sharwood-Smith (1981) discusses Bialystok's (1978) finding concerning the importance of "formal practice" in transforming "explicit knowledge" into "implicit knowledge". Bialystok appears to equate formal practice with explicit teaching and seems to accept that what is practiced is determined by a teacher. It is possible, however, for the individual learner to make a conscious decision to use a particular word, phrase, or set of utterances. (See Schmidt & Frota 1986:269, 319.) Sharwood-Smith argues (1981:166) that

some aspects of second language performance can in principle be planned from the start entirely on the basis of explicit knowledge...Let us also suppose that this type of activity is repeated again and again. In such situations, it is

## Notes

1 As no evidence concerning recording, transcription and analysis of speech samples is provided, it must be assumed that these tasks were done solely by Danielewicz. The reliability of the analyses cannot therefore be regarded as fully established (even ignoring the question of sample size).

2 This evidence came mainly from retrospective self-report data -- not the most reliable technique, see Ericsson & Simon (1982).

3 The term appears to have been used to refer to the learner planning his/her learning activities as well as language production (Naiman et al. 1978:3, Stern 1975:314-5).

4 It should be stressed that the extent to which planning and speech can go on simultaneously would depend to some extent on the degree of complexity of what is being expressed. In addition, Ford's description may be less likely than others to apply to NNSs, because it presupposes substantial automaticity in the execution of the utterance.

5 This model is increasingly criticized, on a variety of grounds, not only in psychology, e.g., Estes (1980), McClelland, Rumelhart & Hinton (1986), Navon (1985), Neisser (1976), Pribram (1985), but also by some SL researchers, e.g., Dell (1985), Reilly (1985).

6 Although the information-processing model of human cognition is far from perfect (and despite the criticisms cited in note 5) most aspects of it have been subjected to much more stringent and extensive empirical test than isolated theories of SLA such as those of Krashen or Ellis.

7 This is not to say that all knowledge involved in the successful use of a cognitive skill must be presented explicitly.

8 Kleiner (1985) observes that there has been little attempt to develop such obviously needed heuristics. Recent work on the problem, both his own and that of Nickles (1980, 1981), has unfortunately been concerned with the related but less immediately relevant problem of solution-adequacy rather than problem analysis.

## References

- Achinstein, P. (1983). The nature of explanation. Oxford University Press.
- Allen, J. J. (1986). A developmental approach to self-monitoring behavior. Communication Monographs 53, 277-288.
- Andersen, R. (1976). A functor acquisition hierarchy study in Puerto Rico. Paper presented at the 10th. Annual TESOL Convention, New York.
- Anderson, J. R. (Ed.). (1981). Cognitive skills and their acquisition. Hillsdale NJ: Erlbaum.
- Anderson, J. R. (1982). Acquisition of cognitive skill. Psychological Review 89, 4, 369-406.
- Anderson, J. R. (1983). The architecture of cognition. Hillsdale NJ: Erlbaum.
- Andre, T. & Phye, G. D. (1986). Cognition, learning, and education. In G. D. Phye & T. Andre (Eds.), Cognitive classroom learning: understanding, thinking and problem solving (pp.1-19). Orlando: Academic Press.
- Austin, J. L. (1962). How to do things with words. Oxford: OUP.
- Bahns, J., Burmeister, H. & Vogel, T. (1986). The pragmatics of formulas in L2 learner speech: use and development. Journal of Pragmatics 10, 693-723.
- Bailey, N., Madden, C. & Krashen, S. D. (1974). Is there a "natural sequence" in second language learning? Language Learning 24, 2, 235-243.
- Barash, R. (Ed.). (forthcoming). Responses to Krashen. Rowley MA: Newbury House.
- Beattie, G. W. (1980). The role of language production processes in the organization of behavior in face-to-face interaction. In B. Butterworth (Ed.), Language production vol. 1, (pp.69-107). London: Academic Press.
- Beebe, L. (1983). Risk-taking and the language learner. In H. W. Seliger & M. H. Long (Eds.), Classroom oriented research in SLA (pp.39-65). Rowley MA: Newbury House.
- Bell, A. (1982). Radio: the style of news language. Journal of Communication 32, 150-164.
- Bell, A. (1984). Language style as audience design. Language in Society 13, 145-204.
- Benedict, R. (1946). The chrysanthemum and the sword. NY: New American Library.
- Berg, T. (1986a). The problems of language control: editing, monitoring, and feedback. Psychological Research 48, 133-144.
- Berg, T. (1986b). The aftermath of error occurrence: psycholinguistic evidence from cut-offs. Language and Communication 6, 3, 195-213.
- Bialystok, E. (1978). A theoretical model of second language learning. Language Learning 28, 69-84.
- Bialystok, E. (1979). Some evidence for the integrity and interaction of two knowledge sources. Paper presented at the 13th. annual TESOL convention, Boston MA.
- Bialystok, E. (1982). On the relationship between knowing and using grammatical forms. Applied Linguistics 3, 3, 181-206.
- Black, J. A. & Champion, D. J. (1976). Methods and issues in



- social research. NY: Wiley.
- Bock, J. K. (1982). Toward a cognitive psychology of syntax: information processing contributions to sentence formulation. Psychological Review 89, 1-47.
- Boomer, D. S. (1965). Hesitation and grammatical encoding. Language and Speech 8, 148-158.
- Boomer, D. S. (1978). The phonemic clause: speech unit in human communication. In A. W. Siegman & S. Feldstein (Eds.), Nonverbal behavior and communication (pp.245-262). Hillsdale NJ: Erlbaum.
- Botha, R. P. (1981). The conduct of linguistic inquiry. Hague: Mouton.
- Bower, G. H. (1975). Cognitive psychology: an introduction. In W. K. Estes (Ed.), Handbook of learning and cognitive processes (vol. 1, pp.25-80). Hillsdale NJ: Erlbaum.
- Brainin, S. S. (1985). Mediating learning: pedagogic issues in the improvement of cognitive functioning. Review of Research in Education 12, 121-155. Washington DC: American Educational Research Institution.
- Brotherton, P. (1979). Speaking and not speaking: processes for translating ideas into speech. In A. W. Siegman & S. Feldstein (Eds.), Of speech and time. Hillsdale NJ: Erlbaum.
- Brown, A. & Campione, J. C. (1981). Three faces of transfer: implications for early competence, individual differences, and instruction. In M. E. Lamb, A. Brown & B. Rogoff (Eds.), Advances in developmental psychology (vol.3, pp.143-192). Hillsdale NJ: Erlbaum.
- Bunge, M. (1967). Scientific research (vol. 1). NY: Springer-Verlag.
- Butterworth, B. (1975). Hesitation and semantic planning in speech. Journal of Psycholinguistic Research 4, 75-87.
- Butterworth, B. (Ed.). (1980a). Language production vol. 1. London: Academic Press.
- Butterworth, B. (1980b). Evidence from pauses in speech. In B. Butterworth (Ed.), Language production (vol. 1, pp.155-176). London: Academic Press.
- Butterworth, B. (1980c). Some constraints on models of language production. In B. Butterworth (Ed.), Language production (vol. 1, pp.423-459). London: Academic Press.
- Chafe, W. L. (1982). Integration and involvement in speaking, writing, and oral literature. In D. Tannen (Ed.), Spoken and written language (pp.35-53). Norwood NJ: Ablex.
- Chaudron, C. (1983). Simplification of input: topic reinstatements and their effects on L2 learners' recognition and recall. TESOL Quarterly 17, 3, 437-458.
- Chaudron, C. (1985). Intake: on models and methods for discovering learners' processing of input. Studies in Second Language Acquisition 7, 1, 1-14.
- Clark, H. H. & Clark, E. V. (1977). Psychology and language. NY: Harcourt Brace Jovanovitch.
- Cohen, D. (Ed.). (1974). Explaining linguistic phenomena. NY: Wiley.
- Cohen, P. R. & Perrault, C. R. (1979). Elements of a plan-based theory of speech acts. Cognitive Science 3, 177-212.
- Corder, S. P. (1967). The significance of learners' errors.

- International Review of Applied Linguistics , 161-170.
- Coupland, N. (1980). Style shifting in a Cardiff work setting. Language in Society 9, 1-12.
- Coupland, N. (1981). The social differentiation of functional language use. PhD dissertation, University of Wales Institute of Science and Technology.
- Cummins, R. (1975). Functional analysis. Journal of Philosophy 72, 741-764.
- Cummins, R. (1983). Psychological explanation. Cambridge, MA: MIT Press.
- Dabbs, J. M., Evans, M. S., Hopper, C. H. & Purvis, J. A. (1980). Self-monitors in conversation: what do they monitor? Journal of Personality and Social Psychology 39, 2, 278-294.
- Danielewicz, J. M. (1984). The interaction between text and context: a study of how adults and children use spoken and written language in four contexts. In A. D. Pellegrini & T. D. Yawkey (Eds.), The development of oral and written language in social contexts (pp.243-260). Norwood NJ: Ablex.
- Day, R. R. (1984). Student participation in the ESL classroom or some imperfections in practice. Language Learning 34, 3, 69-102.
- Dechert, H. W. (1983). How a story is done in a second language. In C. Faerch & G. Kaspar, (Eds.), Strategies in interlanguage communication (pp.xx-xx). London: Longman.
- Dechert, H. W. & Raupach, M. (Eds.). (1980). Towards a cross-linguistic assessment of speech production. Frankfurt: Lang.
- Dechert, H. W., Möhle, D. & Raupach, M. (Eds.). (1984). Second language productions. Tübingen: Gunter Narr.
- De Lisi, R. (1987). A cognitive-developmental model of planning. In S. L. Friedman, E. K. Scholnick & R. R. Cocking (Eds.), Blueprints for thinking (pp.79-109). Cambridge: Cambridge University Press.
- Dell, G. S. (1985). Positive feedback in hierarchical connectionist models: applications to language production. Cognitive Science 9, 3-23.
- Deschamps, A. (1980). The syntactic distribution of pauses in English spoken as a second language. In H. W. Dechert & M. Raupach (Eds.), Temporal variables in speech (pp.255-262). Frankfurt: Lang.
- Dickerson, W. B. (1971). Hesitation phenomena in the spontaneous speech of non-native speakers of English. PhD dissertation, University of Illinois.
- Dodd, D. H. & White, R. M. (1980). Cognition. Boston: Allyn & Bacon.
- Downing, J. (1984). Task awareness in the development of reading skill. In J. Downing & R. Valtin (Eds.), Language awareness and learning to read (pp.27-55). NY: Springer-Verlag.
- Downing, J. & Leong, C. K. (1982). Psychology of reading. NY: Macmillan.
- Ellis, R. (1982). Discourse processes in classroom second language development. PhD thesis, University of London.
- Ellis, R. (1985a). Understanding second language acquisition. Oxford: Oxford University Press.
- Ellis, R. (1985b). A variable competence model of second language acquisition. IRAL 23, 1, 47-59.

- Ellis, R. (1987). Interlanguage variability in narrative discourse: style shifting in the use of the past tense. Studies in Second Language Acquisition 9, 1-20.
- Ericsson, H. K. & Simon, H. (1982). Protocol analysis. Cambridge MA: MIT Press.
- Estes, W. K. (1978). On the organization and core concepts of learning theory and cognitive psychology. In W. K. Estes (Ed.), Handbook of learning and cognitive processes (vol. 6, pp.235-262). Hillsdale NJ: Erlbaum.
- Estes, W. K. (1980). Is human memory obsolete? American Scientist 68, 1, 62-69.
- Faerch, C. & Kaspar, G. (1983). Plans and strategies in foreign language communication. In C. Faerch & G. Kaspar, (Eds.), Strategies in interlanguage communication (pp.20-60). London: Longman.
- Fathman, A. K. (1980). Repetition and correction as an indication of speech planning and execution processes among second language learners. In H. W. Dechert & M. Raupach (Eds.), Towards a cross-linguistic assessment of speech production (pp.77-86). Frankfurt: Lang.
- Fiske, S. T. (1986). Schema-based versus piecemeal politics. In R. R. Lau & D. O. Sears (Eds.), Political cognition (pp.41-53). Hillsdale NJ: Erlbaum.
- Fitts, P. M. (1964). Perceptual-motor skill learning. In A. W. Melton (Ed.), Categories of human learning (pp.244-285). NY: Academic Press.
- Ford, M. (1982) Sentence planning units: implications for the speaker's representation of meaningful relations underlying sentences. In J. Bresnan (Ed.), The mental representation of grammatical relations (pp.797-827). Cambridge MA: MIT Press.
- Ford, M. & Holmes, V. M. (1978). Planning units and syntax in sentence production. Cognition 6, 35-53.
- Foss, D. J. & D. T. Hakes. (1978). Psycholinguistics. Englewood Cliffs, NJ: Prentice-Hall.
- Friedman, S. L., Scholnick, E. F. & Cocking, R. R. (Eds.). (1987). Blueprints for thinking. Cambridge: Cambridge University Press.
- Frese, M. & Stewart, J. (1984). Skill learning as a concept in life-span developmental psychology. Human Development 27, 145-162.
- Fromkin, V. (1971). The non-anomalous nature of anomalous utterances. Language 47, 27-52.
- Gal, S. (1978). Language shift: social determinants of linguistic change in bilingual Austria. NY: Academic Press.
- Garrett, M. F. (1975). The analysis of sentence production. In G. H. Bower (Ed.), The psychology of learning and motivation (vol. 9, pp.133-177). NY: Academic Press.
- Garrett, N. (1986). The problem with grammar: what kind can the language learner use? Modern Language Journal 70, 2, 133-148.
- Gladwin, H. & Murtaugh, M. (1980). The attentive-preattentive distinction in agricultural decision making. In P. Bartlett (Ed.), Agricultural decision making (pp.115-136). NY: Academic Press.
- Glymour, C. A. (1980). Theory and evidence. Princeton: Princeton

- University Press.
- Goldman-Eisler, F. (1958). Speech production and the predictability of words in context. Quarterly Journal of Experimental Psychology 10, 96-106.
- Goldman-Eisler, F. (1968). Psycholinguistics: experiments in spontaneous speech. London: Academic Press.
- Greenwald, A. G., Leippe, M. R., Pratkanis, A. R. & Baumgardner, M. H. (1986). Under what conditions does theory obstruct research progress? Psychological Review 93, 2, 216-229.
- Gregg, K. (1984). Krashen's Monitor and Occam's razor. Applied Linguistics 5, 2, 79-100.
- Gregg, K. (forthcoming). Krashen's theory, acquisition theory, and theory. In R. M. Barsach (Ed.), Responses to Krashen. Rowley MA: Newbury House.
- Grigg, T. (1986). The effect of task, time, and rule knowledge on grammar performance for three English structures. Working Papers 5, 1, 37-60. Department of ESL, University of Hawaii.
- Gudykunst, W. B., Yang, S. M. & Nishida, T. (1987). Cultural differences in self-consciousness and self-monitoring. Communication Research 14, 1, 7-34.
- Harre, R. (1987). Varieties of realism. NY: Basil Blackwell.
- Hatch, E. (1983). Psycholinguistics. Rowley MA: Newbury House.
- Haugeland, J. (1981). The nature and plausibility of cognitivism. In J. Haugeland (Ed.), Mind design (pp.243-281). Montgomery VT: Bradford Books.
- Hayes, J. R. (1981). The complete problem solver. Philadelphia PA: Franklin Institute.
- Hayes-Roth, B. & Hayes-Roth, F. (1979). A cognitive model of planning. Cognitive Science 3, 275-310.
- Hayes-Roth, F., Klahr, P. & Mostow, D. J. (1981). Advice taking and knowledge refinement. In J. R. Anderson (Ed.), Cognitive skills and their acquisition (pp.231-254). Hillsdale NJ: Erlbaum.
- Hempel, C. G. (1965). Aspects of scientific explanation and other essays in the philosophy of science. NY: Free Press
- Hieke, A. E. (1981). A content-processing view of hesitation phenomena. Language & Speech 24, 147-160.
- Hobbs, J. R. & Evans, D. A. (1980). Conversation as planned behavior. Cognitive Science 4, 349-377.
- Hockett, C. F. (1967). Where the tongue slips, there slip I. In V. A. Fromkin (Ed.), Speech errors as linguistic evidence (pp.93-119). Hague: Mouton.
- Holmes, V. M. (1984). Sentence planning in a story continuation task. Language and Speech 27, 2, 115-134.
- Hulstijn, J. H. & Hulstijn, W. (1984). Grammatical errors as a function of processing constraints and explicit knowledge. Language Learning 34, 23-43.
- Ickes, W. & Barnes, R. D. (1977). The role of sex and self-monitoring in unstructured dyadic interactions. Journal of Personality and Social Psychology 46, 1349-1364.
- Jensen, J. M. (1973). A comparative investigation of the casual and careful oral language styles of average and superior fifth grade boys and girls. Research in the Teaching of English 7, 338-350.
- Johannsen, G. & Rouse, W. B. (1983). Studies of planning behavior

- of aircraft pilots in normal, abnormal and emergency situations. IEEE Transactions on Systems, Man, and Cybernetics SMC-13, 3, 267-278.
- Kahneman, D. & Treisman, A. (1984). Changing views of attention and automaticity. In R. Parasuraman & D. R. Davies (Eds.), Varieties of attention (pp.29-62). Orlando: Academic Press.
- Kempen, G. (1977). Conceptualizing and formulating in sentence production. In S. Rosenberg (Ed.), Sentence production (pp.259-275). Hillsdale NJ: Erlbaum.
- Kempen, G. & Hoenkamp, E. (1982). An incremental procedural grammar for sentence formulation. Internal report, Psychology Department, Nijmegen University.
- Kleiner, S. A. (1985). Interrogatives, problems and scientific inquiry. Synthese 68, 3, 365-428.
- Kolers, P. A. & Smythe, W. E. (1984). Symbol manipulation: alternatives to the computational view of mind. Journal of Verbal Learning and Verbal Behavior 23, 289-314.
- Krashen, S. D. (1976). Formal and informal linguistic environments in language learning and language acquisition. TESOL Quarterly 10, 157-168.
- Krashen, S. D. (1978). The Monitor Model for second-language acquisition. In R. C. Gingras (Ed.), Second language acquisition and foreign language teaching (pp.1-26). Arlington VA: Center for Applied Linguistics.
- Krashen, S. D. (1981). Second language acquisition and second language learning. Oxford: Pergamon Press.
- Krashen, S. D. (1982). Principles and practice in second language acquisition. Oxford: Pergamon Press.
- Krashen, S. D. (1983). Newmark's "ignorance hypothesis" and current second language acquisition theory. In S. Gass & L. Selinker (Eds.), Language transfer in language learning (pp.135-153). Rowley MA: Newbury House.
- Krashen, S. D., Butler, J., Birnbaum, R. & Robertson, J. (1978). Two studies in language acquisition and language learning. ITL Review of Applied Linguistics 39/40, 73-92.
- Krashen, S. D. & Pon, (1975). An error analysis of an advanced ESL learner: the importance of the Monitor. Working Papers on Bilingualism 7, 125-129.
- Kroll, B. (1977). Combining ideas in written and spoken English: a look at subordination and coordination. In E. Ochs Keenan & T. L. Bennett (Eds.), Discourse across time and space (pp.69-108). Southern California Occasional Papers in Linguistics #5. Department of Linguistics, University of Southern California, Los Angeles.
- Kuhn, T. (1962). The structure of scientific revolutions. Chicago: University of Chicago Press.
- Labov, W. (1969). Contraction deletion and the inherent variability of the English copula. Language 45, 4, 715-762.
- Labov, W. (1970). The study of language in its social context. Studium Generale 23, 30-87.
- Labov, W. (1972). Sociolinguistic patterns. Philadelphia: University of Pennsylvania Press.
- Lakatos, I., & Musgrave, A. (Eds.). (1970). Criticism and the growth of knowledge. Cambridge: CUP.
- Larsen-Freeman, D. (1975). The acquisition of grammatical

- morphemes by adult ESL students. TESOL Quarterly 9, 409-42
- Laver, J. D. M. (1970). The production of speech. In J. Lyons (Ed.), New horizons in linguistics (pp.53-75). Harmondsworth: Penguin.
- Laver, J. D. M. (1973). The detection and correction of slips of the tongue. In V. A. Fromkin (Ed.), Speech errors as linguistic evidence (pp.132-143). Hague: Mouton.
- Laver, J. D. M. (1980). Monitoring systems in the neurolinguistic control of speech production. In V. A. Fromkin (Ed.), Errors in linguistic performance (pp.287-305). NY: Academic Press.
- Lennon, P. (1984). Retelling a story in English as a second language. In H. W. Dechert, D. Möhle & M. Raupach (Eds.), Second language productions (pp.50-68). Tübingen: Gunter Narr.
- Levelt, W. J. M. (1978). Skill theory and language teaching. Studies in Second Language Acquisition 1, 1, 53-70.
- Levelt, W. J. M. (1983). Monitoring and self-repair in speech. Cognition 14, 41-104.
- Loban, W. (1966). Language ability: grades seven, eight and nine. Washington DC: Government Printing Office.
- Long, M. H. (1985). Theory construction in second language acquisition. Paper presented at the 5th. Second Language Research Forum, UCLA.
- MacWhinney, B. & Anderson, J. R. (1986). The acquisition of grammar. In I. Gopnick & M. Gopnick (Eds.), From models to modules (pp.3-25). Norwood NJ: Ablex.
- MacWhinney, B. & Osser, H. (1977). Verbal planning functions in children's speech. Child Development 48, 978-985.
- Mahl, G. (1972). People talking when they can't hear their voices. In A. Siegman & B. Pope (Eds.), Studies in dyadic communication (pp.211-264). NY: Pergamon.
- McClelland, J. L. & Rumelhart, D. E. (1981). An interactive activation model of context effects in letter perception: part 1. An account of basic findings. Psychological Review 88, 375-407.
- McClelland, J. L., Rumelhart, D. E. & Hinton, G. E. (1986). The appeal of parallel distributed processing. In McClelland, J. L., Rumelhart, D. E. & the PDP Research Group, Parallel distributed processing (vol. 1, pp.3-44). Cambridge MA: MIT Press.
- McLaughlin, B. (1978). The Monitor Model: some methodological considerations. Language Learning 28, 309-332.
- McLaughlin, B. (1987). Theories of second language learning. London: Edward Arnold.
- McLaughlin, B., Rossman, T. & McLeod, B. (1983). Second language learning: an information-processing perspective. Language Learning 33, 2, 135-158.
- McLeod, B. & McLaughlin, B. (1986). Restructuring or automaticity? Reading in a second language. Language Learning 36, 109-123.
- Meisel, J. M., Clahsen, H. & Pienemann, M. (1981). On determining developmental stages in natural second language acquisition. Studies in Second Language Acquisition 3, 2, 109-135.
- Meyer, J. S. & Rebok, G. W. (1985). Planning-in-action across the life span. In T. M. Shlecker & M. P. Toyliia (Eds.), New

- directions in cognitive science (pp.47-67). Norwood NJ: Ablex.
- Michaels, S. & Collins, J. (1984). Children's discourse styles: classroom interaction and the acquisition of literacy. In D. Tannen (Ed.), Coherence in spoken and written discourse (pp.219-244). Norwood NJ: Ablex.
- Miller, G. A., Galanter, E. H. & Pribram, H. H. (1960). Plans and the structure of behavior. NY: Holt.
- Miller, G. A. & Johnson-Laird, P. N. (1976). Language and perception. Cambridge MA: Harvard University Press.
- Möhle, D. (1984). A comparison of the second language speech production of different native speakers. In H. W. Dechert, D. Möhle & M. Raupach (Eds.), Second language productions (pp.26-49). Tübingen: Gunter Narr.
- Morrison, D. M. & Low, G. (1983). Monitoring and the second language learner. In J. C. Richards and R. W. Schmidt (Eds.), Language and communication (pp.228-250). London: Longman.
- Motley, M. T., Baars, B. J. & Camden, C. T. (1983). Experimental verbal slip studies: a review and editing model of language encoding. Communication Monographs 50, 79-101.
- Nagel, E. (1961). The structure of science. London: Routledge & Kegan Paul.
- Naiman, N., Fröhlich, M., Stern, H. H. & Todesco, A. (1978). The good language learner. Toronto: OISE.
- Navon, D. (1985). Attention division or attention sharing? In M. I. Posner & O. S. M. Marin (Eds.), Attention and Performance XI (pp.133-146). Hillsdale NJ: Erlbaum.
- Neisser, U. (1967). Cognitive psychology. NY: Appleton-Century-Crofts.
- Neisser, U. (1976). Cognition and reality. San Francisco: W. H. Freeman.
- Neumann, O. (1987). Beyond capacity: a functional view of attention. In H. Heuer & A. F. Sanders (Eds.), Perspectives on perception and action (pp.361-394). Hillsdale NJ: Erlbaum.
- Neves, D. M. & Anderson, J. R. (1981). Knowledge compilation: mechanisms for the automatization of cognitive skills. In J. R. Anderson (Ed.), Cognitive skills and their acquisition (pp.57-84). Hillsdale NJ: Erlbaum.
- Newell, A. & Rosenbloom, P. S. (1981). Mechanisms of skill acquisition and the law of practice. In J. R. Anderson (Ed.), Cognitive skills and their acquisition (pp.1-56). Hillsdale NJ: Erlbaum.
- Newman, D. & Bruce, B. C. (1986). Interpretation and manipulation in human plans. Discourse Processes 9, 167-195.
- Nickles, T. (1980). Scientific discovery and the future of philosophy of science. In T. Nickles (Ed.), Scientific discovery, logic, and rationality (pp.1-59). Boston: Dordrecht.
- Nickles, T. (1981). What is a problem that we may solve it? Synthese 47, 85-118.
- Nutter, N. (1982). The effects of "consciousness of correctness" on amount, fluency, and syntax of adolescents' speech. Research in the Teaching of English 16, 2, 149-170.
- Ochs, E. (1979). Planned and unplanned discourse. In T. Givón

- (Ed.), Syntax and semantics 12: discourse and syntax (pp.51-80). NY: Academic Press.
- Ochs Keenan, E. & T. L. Bennett (Eds.). (1977). Discourse across time and space. Southern California Occasional Papers in Linguistics #5. Department of Linguistics, University of Southern California, Los Angeles.
- O'Malley, J. M., Chamot, A. U., Stewner-Manzanares, G., Russo, R. & Kupper, L. (1985). Learning strategy applications with students of English as a second language. TESOL Quarterly 19, 3, 557-584.
- O'Malley, J. M., Chamot, A. U. & Walker, C. (1987). Some applications of cognitive theory to second language acquisition. Studies in Second Language Aquisition 9, 3, 287-306.
- Oyama, S. (1976). A sensitive period for the acquisition of a nonnative phonological system. Journal of Psycholinguistic Research 5, 261-283.
- Parrish, B., Tarone, E. & Taghavi, R. (1986). Article usage in interlanguage: a study in task-related variability. Paper presented at the 20th. annual TESOL convention, Anaheim CA.
- Pribram, K. H. (1985). 'Holism' could close cognition era. APA Monitor 16, 9.
- Pylyshyn, Z. W. (1981). Complexity and the study of artificial intelligence. In J. Haugeland (Ed.), Mind design (pp.67-94). Montgometry VT: Bradford Books.
- Pylyshyn, Z. W. (1987). Cognitive science. In S. C. Shapiro & D. Eckroth (Eds.), Encyclopedia of artificial intelligence (vol. 1) (pp.120-124). NY: Wiley.
- Rabinowitz, F. M., Grant, M. J. & Dingley, H. L. (1987). Computer simulation, cognition, and development: an introduction. In J. Bisanz, C. J. Brainerd & R. Kail (Eds.), Formal methods in developmental psychology (pp.263-301). NY: Springer-Verlag.
- Randall, R. A. (1987). Planning in cross-cultural settings. In S. L. Friedman, E. K. Scholnick & R. R. Cocking (Eds.), Blueprints for thinking (pp.39-75). Cambridge: Cambridge University Press.
- Raupach, M. (1980). Cross-linguistic descriptions of speech performance as a contribution to contrastive psycholinguistics. In H. W. Dechert & M. Raupach (Eds.), Towards a cross-linguistic assessment of speech production (pp.9-22). Frankfurt: Lang.
- Raupach, M. (1984). Formulae in speech production. In Dechert, H. W., Möhle, D. & Raupach, M. (Eds.). (1984). Second language productions (pp.114-137). Tübingen: Gunter Narr.
- Reilly, R. G. (1985). Control processing versus information processing in models of reading. Journal of Research in Reading 42, 1, 3-19.
- Rickford, J. R. (1979). Variation in a creole continuum: quantitative and implicational approaches. PhD dissertation, University of Pennsylvania.
- Rochester, S. R. & Gill, J. (1973). Production of complex sentences in monologues and dialogues. Journal of Verbal Learning and Verbal Behavior 12, 203-210.
- Rosansky, E. (1976). Methods and morphemes in second language acquisition. Language Learning 26, 409-425.



## Appendix

### A note concerning explanation

A simple statement of the final objective (see Section 4.4.1 above) of a research program in this area would be that it should be the development and test of a theory, with the implied understanding that this is the basis for the most acceptable explanations, these being what scientists are really after. In the present case, this would eventually perhaps result in some theoretical statements couched in terms of the general cognitive information-processing model and a skill-learning theory (such as Anderson's). But what form such a theory would take is not so obvious. It is only recently that SL researchers have begun to question what sort of explanations they wish to arrive at, and what they are prepared to accept as constituting an explanation -- that is, what a SL theory should look like. As linguists are relatively unhelpful in this area (Cohen 1974, Botha 1981), a first step has been to call explicitly for the utilization of the standard late-model logical positivist/ empiricist position: that the objective of research was the development of 'causal-process' theories (formalizable as 'interpreted axiom systems') which could be used to explain events (Hempel 1957, cf. Long 1985, McLaughlin 1987). The general adoption of such a position would undoubtedly improve theory construction attempts of the SL community. But it is desirable to go further, to a higher level of sophistication. The prescriptions of Hempel, Nagel and their colleagues were the result of a program of reconstruction, whereby the explanations of real scientists were recast in modes which suited the dominant philosophy of the 1930s and 40s. With the demise of logical positivism, and the growth of psychological understanding of knowledge, explanation, and the real sociocognitive processes of science (Achinstein 1983, Rubinstein, McLaughlin & McManus 1984) there is less agreement about what form a theory should take. The study of explanations provided by traditional theories has thrown up some logical problems (Glymour 1980; Harré 1987: 44-8, 320-331; and problems with logic: Rosenberg 1985). More practically important, it is no longer accepted that scientific explanations solely relate to the prediction of events, and that only causal explanations are scientific. Most explanations in cognitive science are formal-analytic - that is, they derive their explanatory power from description and analysis (Cummins 1975, 1983). This is not to say the explanations are not embodied in theories. But the interpreted axiom formalization of a causal-process theory is not the only desirable type of scientific theory. Many cognitive scientists regard the computer program which simulates a cognitive process as itself a theory -- though unlike the "traditional" theory (of e.g. Hempel and associates) it is obviously not an argument couched in the form of a set of sentences in first order logical calculus (cf. Simon 1979, Haugeland 1981, Rabinowitz, Grant & Dingley 1987). Harré (1987:70) distinguishes three basic theory types in terms of their properties, of which only that concerned with the "constitution, classification and prediction of observable

