

**DIALOGUE BETWEEN EXPERT AND NOVICE:  
ON DIFFERENCES IN KNOWLEDGE  
AND MEANS TO REDUCE THEM**

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## Abstract

In this paper it is argued that in the instructional dialogue, both the expert and the novice, are involved in a process of solving problems, the problems existing in the goal-directed transfer of knowledge. There is certainly a relation of dominance, simply because of the unequal distribution of knowledge: the expert has the relevant knowledge which the novice requires. This dominance is shown by an asymmetry in designing the verbal exchange: it is the expert who has the privilege of deciding upon the way that the instruction is realized, e.g. choosing the adequate pieces of information and how to verbalize them. However, the novice must agree with the dominance of the expert: the novice accepts the information in order to construct a mental model of what the instruction refers to. Accordingly, the different goals of the two participants are synchronizable so that dominance needs not be negative, but may be constructive in a particular sense. Our research shows that the theoretical orientation along the problem-solving-paradigm, combined with a text-linguistic perspective, can help us to understand what happens in the instructional dialogue as a distinct form of asymmetric and constructive interaction.

## Zusammenfassung

In einer dialogischen Instruktionssituation sehen sich der Instruierende als Experte wie der Instruierte als Novize einem komplexen Problem gegenüber, dessen Lösung in der gemeinsamen, zielorientierten Vermittlung von Wissen besteht. In Situationen dieser Art besteht in aller Regel zwischen den beiden Partnern eine asymmetrische Beziehung, die sich aus der ungleichen Verteilung des relevanten Wissens ergibt: Der Experte verfügt über das relevante Wissen und ist daher im Dialog der dominante Partner. Diese Dominanz wird vom Novizen und vom Experten als spezifisches Merkmal der Instruktionssituation akzeptiert und wirkt sich auf die Dialogführung in erster Linie dadurch aus, daß der Experte entscheidet, welche Informationen in welcher Reihenfolge und in welcher Form er verbalisiert. Der Novize baut mithilfe dieser Information ein mentales Modell des Sachverhalts oder der Handlung auf, auf den/die sich die Instruktion bezieht. Die verschiedenen Ziele der beiden Partner sind synchronisierbar; die Dominanz-Relation ist also in diesen Situationen in spezifischer Weise konstruktiv. Es wird gezeigt, daß das Paradigma des Problemlösens in Verbindung mit text-linguistischen Überlegungen geeignet ist, zur Erklärung der asymmetrischen und konstruktiven sprachlichen Interaktionen in Situationen dieser Art beizutragen.

## 1. Introduction

A common event in verbal interaction is the transfer of knowledge by one dialogue partner to another. These communicative events make up the broad class of instructional exchanges which vary in their content and in their length depending upon the characteristics of the material which is to be transferred. The research reported here addresses the issue of how particular knowledge areas are verbalized and comprehended in instructional dialogues between experts and novices. This special knowledge concerns the carrying out of concrete actions like using a camera, repairing a bicycle tire, or building a model with building blocks. The sum of what is being said by the expert within these instructional dialogues will be called instruction and it contains utterances about the action itself and about the situational determinants i.e. objects, relations, etc. from which the single action steps evolve. The dialogical task of the novice is to grasp the meaning of what is being said by the expert and to bring together the concepts, facts and relationships, that comprise the relevant action knowledge. Instructions are usually delivered over serially connected utterances which are interrupted by the recipient's contributions.

For example: (dialogue within a driving lesson)

I: First of all, declutch

as if you wanted to start

But now, don't put in the bottom gear

but reverse gear

R: how?

like this?

I: yes, very nice

now do not let go of the clutch pedal

and now turn around

support your right arm on the back

rest and look out through the back

stay seated like this as long as you

are driving backwards

R: why this?

I: So, you've got your left foot

on the clutch pedal

the right one

above the accelerator

R: M/hm.

Within the instructional dialogue, the whole action which is to be instructed is broken down into its smaller component parts which are given successively by the instructor. Usually, the recipient does not play the role of a passive listener, but contributes to the dialogue in an active way. S/he keeps in line at least by giving some signals of understanding or non-understanding like in the example above.

At first sight the question of dialogical dominance in these kinds of instructional situations seems to be quite clear. It seems to be a consequence of unequal knowledge distribution. The dominance is on the side of the expert who, because of his/her knowledge superiority, designs and controls the knowledge transfer in different ways, whereas

the novice follows it and is brought from low to higher competence. This particular dominance relation due to knowledge superiority, provides a regularity which is to be accepted by both participants at the outset. For the one who is delivering the instruction it should be clear that s/he is ready to transfer his/her knowledge; for the one who wants to learn in the course of the dialogue it implies agreement with the dominance of the expert. Both participants, the instructor and the recipient, bring this pragmatic knowledge into the instructional dialogue as a knowledge which is part of the common ground (Stalnaker, 1978) of the dialogue partners. The common ground includes world knowledge as well as pragmatic knowledge in the sense of knowing about situations and about the adequate language use within these situations (Graumann & Wintermantel, 1984). The knowledge that a particular dominance relation between instructor and recipient is characteristic of the instructional dialogue, and, the knowledge that there must be a reciprocal acceptance of those involved in the instructional dialogue, both belong to the above mentioned common ground as does the knowledge that these particular conditions lead to a certain asymmetry in the verbal exchange. Accordingly, the unequal distribution of knowledge and the conclusive asymmetry can be taken as a first feature of instructional dialogues.

A rough inspection of examples of instructional dialogues and dialogue fragments leads us to state a second characteristic feature. Being more or less sharply outlined against other sorts of verbal exchanges these dialogues

distinguish themselves by their goal-directedness. This does not mean that other verbal interactions are not goal-directed, but instruction dialogues differ from the others because of the intentional way the two participants contribute to one common goal, namely that of equalizing the initial unequal knowledge distribution.

To summarize the global description of the particular constellation which is prototypical for the instructional dialogues we are studying: there is an expert who knows how to carry out a concrete action like repairing a bicycle tire or paddling a canoe, and there is a novice who does not yet know how to do it, but who wants to learn the skill. We can presume that the expert is intending to let the novice know. The expert knows how to verbalize his/her action knowledge and the novice knows what to extract from the expert's verbal utterances in order to understand the meaning and to incorporate the new information into his/her existing pre-knowledge.

## **2. The conceptual prerequisites of instructional exchanges**

How can we describe and explain the functioning of knowledge transfer taking place within such a social situation? When putting these issues into a cognitive psychological perspective, the following questions have to be answered:

i) What does the expert really know about the concrete action to be instructed and how is this knowledge mentally

represented?

ii) What kinds of processes are responsible for the transformation of action knowledge into other-related speech in the course of the instruction dialogue?

iii) What are the processes which control the comprehension on the novice's side?

The following three processual aspects of the expert-novice-dialogue as an interpersonal exchange are included in these questions:

- (a) producing and understanding of discourses
- (b) representing of action knowledge as the conceptual basis for verbal instructing
- (c) constituting the dialogue and contributing to it on the instructor's as well as the recipient's side.

#### **a) PRODUCING AND UNDERSTANDING OF DISCOURSES**

Because an instruction for carrying out some practical actions with varying degrees of complexity consists of connected utterances that are semantically coherent, it can be seen as a text or discourse. In linguistic terms it constitutes a special sort of text which can be defined as the description of an action sequence being attached to some situational states. The beginning and the end of the instruction are fixed by the limits of the real action sequence; the single utterances being connected, as all



together they refer to the same relevant action sequence. They gain their proper meaning only as parts of the whole discourse. This may become clear when looking at an utterance which changes its meaning depending upon the context. The same utterance like

I: Turn the top round or

I: Brush it away

could be placed in different instructions referring to quite different action sequences and thus having different meanings.

Producing such an instruction means to work at a complex communicative task which requires the presentation of a domain of knowledge in textual form so that the recipient not only understands the text but moreover that s/he will be able to carry out the particular action. Thus, the produced discourse should be adequate with regard to the "objective" action sequence, i.e. it should be exhaustive, correct and easy to understand. To determine what in this sense makes a text easy to understand presupposes that we know about the cognitive processes that govern text understanding and subsequent acting.

In recent years research in text processing has concentrated on how and when in the course of the comprehension process the meaning of the whole discourse is comprehended. A large number of results show that text understanding includes a process of continuing verification beginning with the construction of an idea or a model of what the text is about. This model is continually checked against the incoming text information. If the new pieces of

information fit, then the model will be elaborated, if not, it will be modified. In this process, pre-existing general world knowledge is used together with linguistically conveyed information to construct a mental representation of what the text is about. Virtually all models of text comprehension have included explanations of how this constructive activity might occur. Theoretical constructs like "scenario" (Sanford & Garrod, 1981), "situation model" (v. Dijk & Kintsch, 1983) or "mental model" (Johnson-Laird, 1983; Garnham, 1987) were introduced to refer to the mapping of text meaning to some corresponding segments of reality. v. Dijk & Kintsch (1983) as well as Johnson-Laird (1983) assume two independent representations of a text, a model of the text information and a more abstract model that provides an integration of the text-information and other knowledge which functions as basis for the interpretation of the text.

In applying this theoretical approach to the cognitive processes on the recipient's side, we get the following picture: within the instruction dialogue, the textual information is taken in order to construct a mental model of the relevant action sequence. Constructing a mental model requires the continual interaction between the text and the recipient's knowledge; both kinds of information, the old and the new knowledge are used for model construction, elaboration and differentiation. As long as the construction does not end up in a mirror-like representation, rather in a somehow abstract and simplified representation, we may talk about a model. With regard to

the presumed quality of the mental model we can state: when the mental model which the novice is constructing does contain the most relevant features of the real action sequence, then the instruction has been efficient; if the model contains features which are irrelevant for the carrying out of the action sequence, then the instruction did not really succeed.

This was the side of instruction comprehension. What about the production? In the view of the mental model approach we can state that the expert already has a mental model of the action sequence. This model needs not to be complete or consistent, but in each case it is a coherent and interconnected set of concepts and facts which has been tested somehow in reality. We suppose that this model provides the basis of the conceptualization (Levelt, 1989) as the first part of speech production. Thus, it is his/her mental model which has to be transformed into speech.

The expert will not automatically say what the model is about; on the contrary, the instructor as well as any other participant of a dialogue, is assumed to choose between different options of verbalization. We know from many dialogue studies that speakers do vary in the way they verbalize a given subject and adjust their verbal expressions to suit their listeners: thus, speakers as well as listeners are partner-oriented in different ways (Graumann & Herrmann, 1989).

With regard to whole discourses we can assume partner-oriented language use as well. This should hold true also for instructions as sequences of single utterances,

relating to complex patterns of states and changes of states. But partner-orientation within expert-novice dialogues requires more than merely adjusting single utterances to the partner, it requires a process of designing and carrying out quite a complex sequence of utterances, relating to the action knowledge. What does this relevant action knowledge, which is the basis of the instruction, look like?

**b) REPRESENTING OF ACTION KNOWLEDGE AS THE CONCEPTUAL BASIS FOR VERBAL INSTRUCTING**

Giving an adequate instruction presupposes some pertinent knowledge on the side of the expert. In the case of instruction for concrete actions, it should contain knowledge about the correct order of the single action steps, the precise ways of acting them out, the logic of the "in order - to"- relations, and the real objects which have to be handled in the course of action. That is, we have to consider quite a complex knowledge-structure including declarative, procedural and even motor components, which all function together as the conceptual basis for the instruction. It seems reasonable to assume that different experts may have a different knowledge of the same action sequence including the connected objects - they have different mental models. In the case of the chemical procedure called distillation for example, we might find that chemical engineers differ from technical designers with regard to their mental models of the distillation procedure but not in their absolute knowledge.

However, the degree of knowledge can vary too: the expert can know how to utilise objects/machines to their greatest advantage without actually knowing how they function technically. For example, one could be an "expert" in driving a car, without knowing how it actually functions mechanically, similarly one can be an "expert" photographer without knowing the technical aspects of cameras.

On the novice's side the background knowledge can vary as well. One can imagine a novice who knows nothing about filming, while at the same time being well informed about the physical laws governing the optical qualities of camera lenses. The potential variation in knowledge background between expert and novice is large and the instruction taking place is dependent on this constellation. As such, it is not the real difference in knowledge background that determines the discourse, rather it is the assumed difference in knowledge background concerning the task- and subject matter which determines the course of interaction.

The verbal instruction functions as the basis for the construction of a mental model on the side of the novice. Again, we must note that this model can be correct or incorrect, adequate or inadequate, leading to more or fewer correct ways of carrying out the relevant action. The quality of the mental model has to be seen with regard to the function it has been given, as fundamental for the carrying out of the action; and this quality is dependent on the mapping of the instruction to the novice's previously existing knowledge.

Given the mental model as a concept which refers to some

structured internal knowledge representations, what distinguishes actions from objects, states, and changes of states?

The characteristic feature of actions is their goal directedness (v. Cranach et al. 1980), the action components being steps on the way to the goal. Action theorists usually describe the relations between single action-steps and the goal as hierarchically organised; the lower levels relating to the higher ones in means-end relationships. When carrying out a particular action sequence, the hierarchy has to be worked through. With regard to the verbalization of the action knowledge, the expert can choose the level which s/he assumes to be adequate for the novice. More generally, the expert can choose between different options concerning the conceptualizing and the verbalizing of his/her mental model. The option which will actually be chosen is primarily a function of the expert's assumptions with regard to the novice, especially his/her previous knowledge. As the underlying cognitive process seems to be first and foremost a process of searching for different means and deciding upon the right one, we can infer that this is a type of problem solving.

**c) CONSTITUTING THE DIALOGUE AND CONTRIBUTING TO IT ON THE INSTRUCTOR'S AS WELL AS THE RECIPIENT'S SIDE.**

Why can the problem solving paradigm be applied to the description and explanation of instructional dialogues? Usually, a problem is defined as follows (Duncker, 1935;

Newell & Simon, 1972): an undesired primary state is to be changed by operators into a desired final state. The transformation from one state to the other is not obvious. Between the two states there are barriers of quite varying natures which must be overcome if the problem is to be solved. In contrast to tasks which can be classified as demands for which routinised achievement strategies are provided, problems are characterised by the absence of previously developed accomplishment strategies.

Problem solving as information processing is based on two separate structures: the epistemic (the knowledge of the facts) and the heuristic structure, the second one consisting of the transformation operators (Dörner, 1976). Among the transformations, the complexity-reducing operations are essential. Aside from abstraction and reduction, the formation of complexities is an important strategy as it determines the level of detailing upon which a problematic situation can be seen. The formation of complexities means the combination of elements to a whole: e.g. learning how to ride a bike or how to ski implies the combination and the coordination of single movements into an integrated process. With actions, one can differentiate between various levels of complexity. The degree of the chosen level of complexity determines the level of detailing at which an action sequence will be viewed. To find the adequate level of detailing seems to be an important factor in successful problem solving. A high degree is as inefficient as a low degree, because the high degree leads to a situation where the problem solver gets

lost detail, whereas the low degree does not give the chance to make the relevant differentiations.

The question of finding operators to reduce the complexity of the situation should be central for the instructional dialogue as well. Accordingly, we can try to apply the problem solving paradigm to our instructions in the following way: the primary condition for the expert is that the novice is not able to carry out the relevant action because of insufficient knowledge. The novice wants to, or should, accomplish the action however, and the expert should be of assistance. With the help of his/her knowledge s/he has to overcome the barriers which result from the novice's insufficient knowledge. The novice also has to solve a problem as s/he has to proceed from the undesired initial condition of having no knowledge at all about the action sequence, to the desired final state of knowledge. In the course of the instruction dialogue the novice has to overcome barriers of understanding with the help of the expert's statements.

The expert's problem solving results in a more or less adequate verbal presentation of his/her mental model of the relevant action sequence. The adequacy of the presentation is only partly a question of combining information pieces, the other part being on the more pragmatic side of putting the information into speech acts. Here again, a search process for the right operators can be assumed. Later on, I will present some data which support this assumption. In conclusion, it may be considered characteristic for the instruction situation that it is a highly dynamic and



complex reciprocal problem-solving situation.

The relation between the two problem solvers, as involved in the instructional dialogue, is presented in the following overview:

	EXPERT	NOVICE
INITIAL STATE	structured knowledge about the action	no action knowledge
BARRIER	knowledge transfer	model construction
GOAL	knowledge transferred	internal representation
COMMON GOAL	equalizing of knowledge distribution	

Given these theoretical remarks to outline the theoretical framework of our research we now have to show why we consider it a fruitful one.

### **3. Constituting the instructional dialogue as mutual problem solving**

#### **3.1. Adjusting to the novice's competence by modifying the level of detailing.**

In a first study we tried to find out whether the problem solving paradigm, and in particular the complexity reducing strategy of constructing part-whole relationships,

dialogical processes within the asymmetric interaction which takes place in instruction situations. In a learning context the task was to build a fantasy object made up of 27 single building blocks (Legosteine). This fantasy object bore no resemblance to any familiar object and was called Imarello. It consisted of four parts which had to be made out of single lego-blocks. These four parts looked like familiar objects (bridge, stairs, spring-board and platform). The instruction was given in a nonverbal, graphic format. After having learnt how to build the fantasy object, each subject ( $N = 20$ ) had to instruct another person how to do the same. This instruction had to be delivered in a dialogical situation. The results show that 18 of the 20 instructors take the opportunity to refer to the familiar objects by naming them and thus break down the total action into meaningful parts. Only in case of the recipient's non-understanding, the instructor goes to a lower level of the action hierarchy. In order to find out whether instructions with changing levels of detailing (referring to single blocks and to subparts of the model) would be more effective than instructions with a high level of detailing (referring only to single blocks), we compared two accordingly formulated instruction versions with regard to the time needed for making up the Imarello. The results show that the version with changing levels of detailing leads to much shorter "building" times than the version with a high degree of detailing. To change the level of detailing within the instructional discourse seems to be an indicator for the problem solving process, the problem

being the adequate conceptualization and linearization of the particular knowledge in dialogical speech. The adequacy is determined by the characteristics of the action knowledge and by the recipient.

Now, considering the information about the recipient which are utilized by the instructor, how are they given and how do they influence the instructor's speech? In a second study we analysed instructional dialogues with regard to the recipient-related level of detailing chosen by the experts in presenting the critical action sequence (Wintermantel & Siegerstetter, 1988). The experts were 34 car mechanics who were asked to instruct novices in an aspect of the servicing of a car, namely "timing of ignition". The hypothesis was: in the course of the dialogue, the car mechanics would change the level of detailing dependent upon the feedback of the novices. In particular, when the novice signals to the instructor that s/he does not understand what is being said, then the instructor would have to change his/her answer to a different level of the action hierarchy. During the instruction the novice asked questions such as "how?" and "to what purpose ?" which the instructor answered accordingly.

In order to analyse the "movements" of the expert within the action hierarchy, we first had to construct a hypothetical model representing the critical action complex (see figure 1). We did this with the help of other car mechanics.

In a second step, we decomposed the instructions into

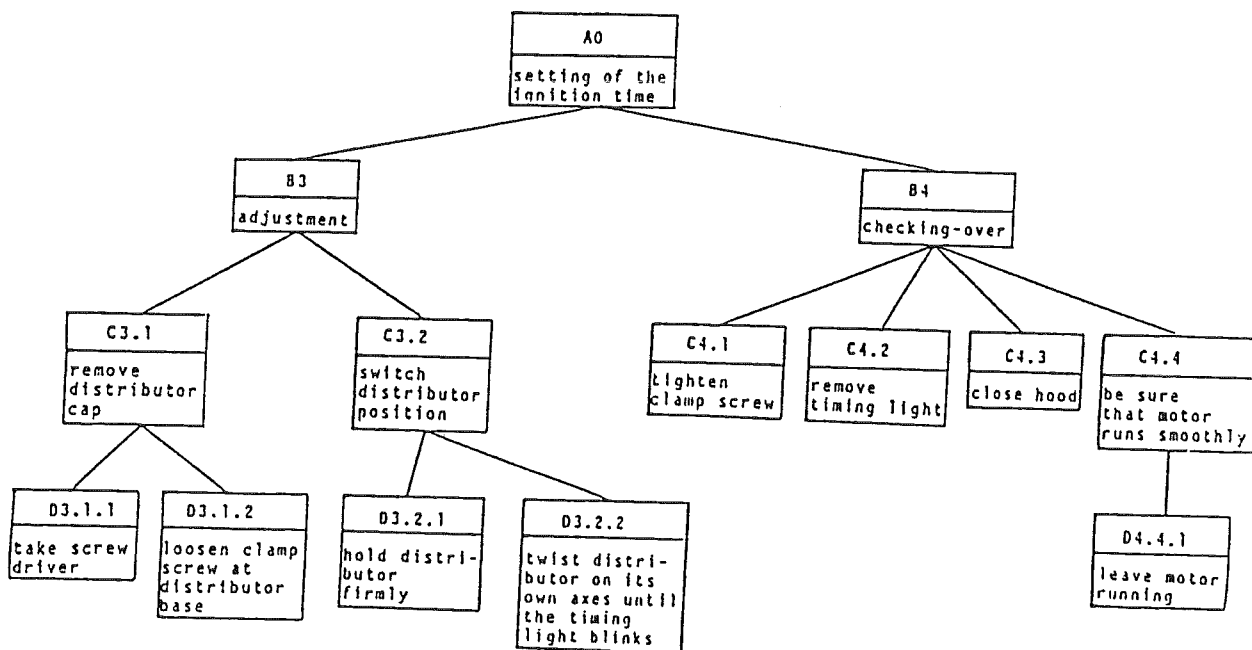
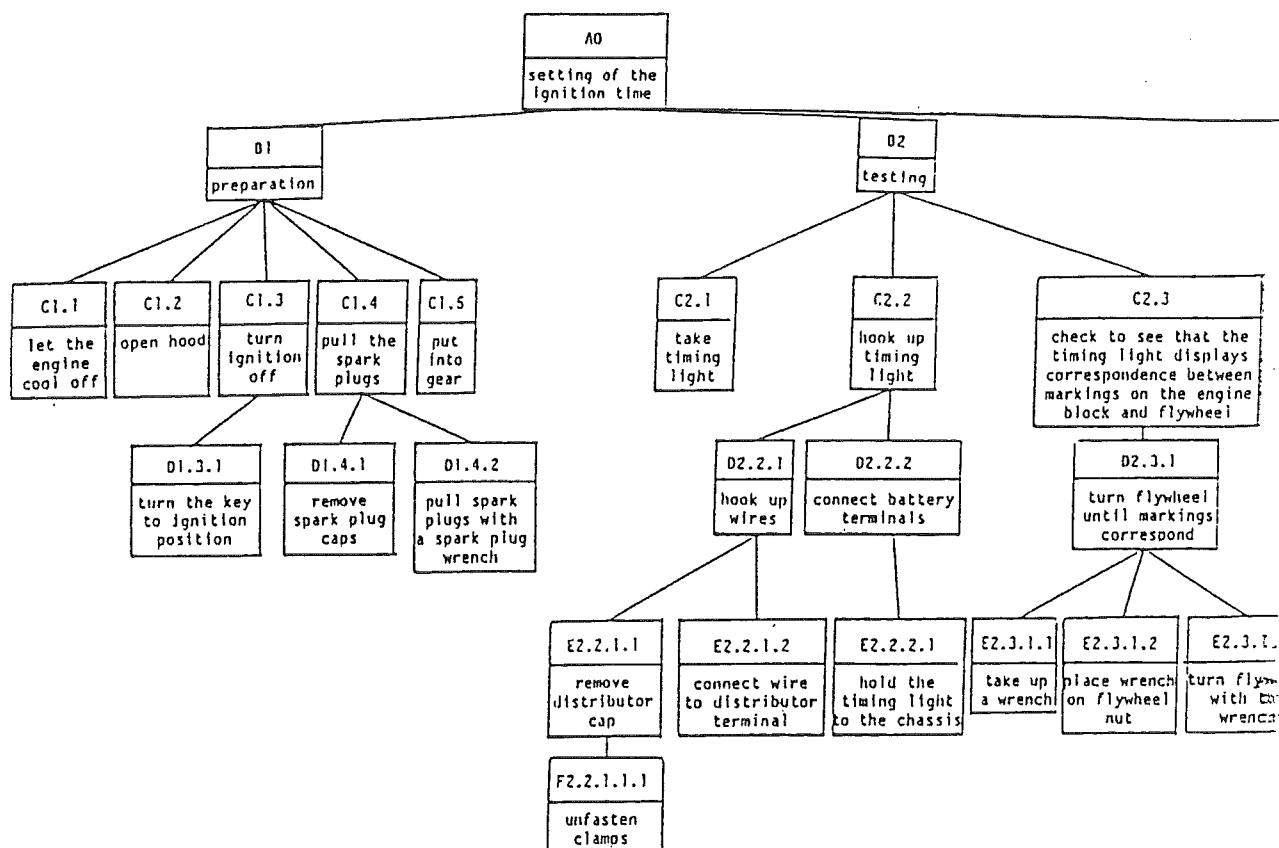


Figure 1: Hierarchical scheme of "timing of ignition".

nucleus sentences, so we could localize each single nucleus within the hierarchy, and pursue the course of the presentation.

We found that the car mechanics did change the degree of detailing of their instructions according to the hearer's questions. With 109 questions in the authentic dialogues, a change of levels took place in 97 cases. The level remained the same in only 12 cases. An important difference was noted between the two kinds of questions: the "to what purpose" questions on the one hand, and the "how" questions on the other. It was found that the instructor moves downward within the action hierarchy after a "how" question and upward after a "to what purpose" question.

These results show that our instructors really did take the opportunity to design the dialogue. They did not only give a precise and exhaustive description of the action sequence - without taking into consideration the novices' reactions, but instead the instructors were oriented towards the novices in a much more dynamic interactive sense. They changed their instruction plans and adjusted their way of organising information throughout the interactions whenever they seemed to be getting signs of non-understanding from the novice's side. And they modified it in a systematic way, which can be explained in the context of the problem-solving paradigm as follows: when planning the verbal presentation of the real action sequence, the first decision the instructor has to make concerns the degree of detailing in which the information is given. In preparing this decision, s/he makes some

global assumptions with regard to the novice's pre-knowledge. E.g. if the novice is a child, then the expert will choose a high level of detailing because s/he does not expect much knowledge from his/her partner. When, in contrast, the novice seems to know more about the action, then the expert will present the information on a rather low degree of detailing, that is, on a general level.

### 3.2 Recipient's questioning and the level of detailing

In a subsequent study we tried to find out whether novices too - while being instructed - expect some information about the hierarchal organisation of the action. To test this question we again let novices make an object out of building blocks. No instructions at all were given; instead, the subjects were sitting in front of 44 coloured single building blocks and had to ask what to do and how. Again, we analyzed the questions with regard to the action hierarchy that is the levels of detailing that are reflected within the single questions (see figure 2).

1489 nucleus-sentences (questions) were produced by the novices. About 20 % of these nuclei could be identified as related to the higher levels of the assumed hierarchy. For example:

R: the white ones are also one upon another?

I: yes

R: like a tower?

I: yes

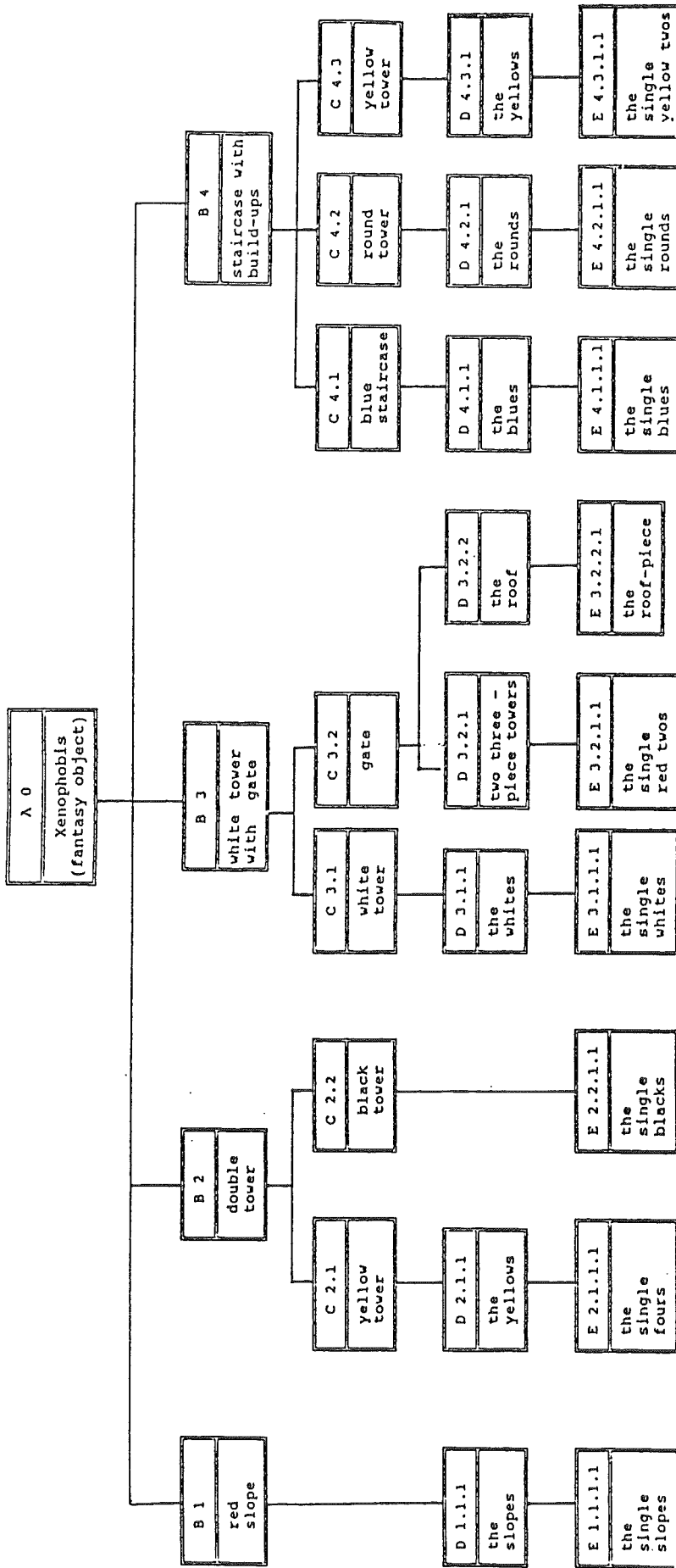


Figure 2: Hierarchical scheme of "object building".

R: do I need all white ones for the tower?

I: yes

This fragment of a protocol may show how novices too try to construct part-whole relationships in order to construct or to complete a whole hierarchical organization of the complex action instead of staying at the highest level of detailing where only the single smallest action steps are located.

Considering the dominance relation between expert and novice, these results, although they were gained in rather restricted experimental settings, indicate that the mutual recognition of the asymmetry in the interaction proceeds with a mutual dependence upon one another - the expert needs some signals of understanding or misunderstanding from the novice for deciding upon the information which shall be given, and the novice needs to have an adequate presentation of the information in order to incorporate it into his/her pre-knowledge and to construct a mental model which can function as the knowledge basis of carrying out the practical action.

### **3.3. Patterns of speech-acts which are characteristic of instructions.**

In the car mechanics as well as in the Imarello study we considered the informational side of the partner-oriented speech in instructional dialogues. The central point in these studies was the systematic movement of the experts



within the assumed hierarchical organization of the action knowledge. Accordingly, the analysis was restricted to the propositional characteristics of the instruction event.

In a further study we confronted the pragmatic side of these kinds of dialogue, namely their interactive function, and looked for the communicative intentions which can be analyzed in terms of speech-act theory (Searle, 1969; Bach & Harnish, 1984). The question is, whether there are special patterns of speech acts realized within expert-novice dialogues. We supposed that with the illocutionary forces, as they can be found in instructions, we could state a kind of hierarchical structure similar to the hierarchical organization of the real action sequence. This hierarchy of illocutions should be of particular relevance for the pragmatics of the speech. In other words, we assume that the combination of single speech acts into the macro speech act "instruction" is again a hierarchical one. In this view, instructing, i.e. the verbalizing of the instruction, can be understood as an activity in itself, and the speech acts all together reflect the whole communicative action sequence of instructing. Thus, we assume typical patterns of "micro"speech acts making up the macro speech act called instruction.

To study this issue we chose for a rather complex action-for -instruction "making a medical examination". In the medical literature, this action sequence is described as a rather formal procedure including "anamnesis", "examination" and "diagnosis", so we supposed to get only a small degree of variance between the contents of the expert

instructions.

The study was undertaken with 18 medical practitioners who were asked to instruct a novice (one of our co-workers) how to do a medical examination (check-up). Moreover, they were asked to go into detail when necessary and to respect the questions of the novice. In the course of the instruction, the novices had to ask questions like "how", "why", and sometimes to state "I don't understand this". There was no fixed schema with regard to the "place" in the dialogue where these signals should be given, because such a schema would have ignored the action plan of the expert. To be sure, the questions should be distributed randomly and uniformly throughout the instructions and they should make sense (e.g. a why-question following an utterance, in which the reason for something was given, would not make sense; questions of this type were avoided). The instructions were tape-recorded and transcribed. Afterwards the instructions were listened to together with the experts, and the experts were interviewed with regard to what they had thought about the novices during the instruction and especially after the questions. With this procedure, we could get some more information about the communicative intentions of the subjects.

The (transcribed) instructions were analysed with regard to the single speech acts and the patterns of speech acts which make up our particular interaction type. We could determine (with quite a high reliability score) five different patterns of speech acts which are characteristic of our discourses and to which nearly all speech acts fit.

The patterns are: DESCRIBING, REASONING, STRUCTURING, ASSURING UNDERSTANDING, and MOTIVATING. These patterns can be further subdivided into micro speech acts which are understood as being located on the lowest level of the speech act hierarchy. They relate to the higher levels in an "in order - to - relation" analogous to the hierarchical organization that we assume for the real action which is instructed. Accordingly, these speech acts too can be described on a high degree of detailing and interpreted in the context of the speech-act pattern to which they belong. As an example: The phrase "Certain sicknesses in childhood can cause later diseases in the inner organs" is - in terms of speech acts - a description of a particular state, an assertion. In the following context however: "I take the anamnesis and ask about any illnesses during childhood," followed by the question: "Why?" the same phrase clearly is a part of the speech act pattern "REASONING". Within this pattern, it can be identified as a speech act of the type "Stating causes". Assigning the degree of detailing in this kind of description is somehow arbitrary and intuitive. The question is, whether we succeed in finding a level on which a meaningful and reliable coordination of micro speech acts is possible. The level of macro speech acts as patterns like e.g. REQUESTING seems to make sure such a coordination. Because whether the REQUESTING pattern is expressed by a statement or by a question does not really modify the direction of the illocutionary force.

The speech act patterns, their definitions and criteria, that we found typical for instructions are :

**DESCRIBING:**

Presentation of the action: describing how to carry out something, how to do something to reach a particular goal.

Presentation of the situational determinants: describing of the objective determinants to which the action is connected, how it looks like, what features it has, etc.

Viewlike presentation: visualizing of the action and the determinants

e.g. "This then looks like it has been coloured red."

Giving an example

e.g. "A cold is also a viral illness."

Drawing analogies: making something concrete by referring to familiar phenomena

e.g. "This is like a headache."

Giving a definition: fixing of the meaning of a concept by naming the features and appreciating the differences between this and other concepts.

e.g. "The lung is the organ which is responsible for providing oxygen."

Generalizing: giving a general description of an action or a state.

e.g. "Blood-pressure is always measured."

**REASONING:**

Giving motives:

e.g. "I ask for the biography, because I don't want to hurt the patient's feelings."

Naming goals:

e.g. "I take a blood sample in order to find out whether

there is an inflammation."

Giving causes: To reason out the procedure by going back to objective causes, which make the procedure seem adequate.

e.g. "I must then first check the heart functions because a cause may also lie here."

Contrasting: Showing that one means is better than another.

e.g. "If I only question by rote, I won't learn about the problem that brought the patient to me."

Generalisation: Reasoning by making general comments.

e.g. "It can never be wrong to look for the reflexes."

#### **STRUCTURING:**

Instruction-related: Relating to the course of instruction in an explicit way.

e.g. "Let me first give you an overview."

Action-related: explicit structuring of the content of the relevant action.

e.g. "And then you must look for other signs."

Referring to general goals: implicit structuring of the conversation or the action by the assigning of central concepts or goals.

e.g. "The whole thing is done in order to find out what is going wrong."

Refusing: reaction to a question which cannot be answered directly in the expected way. May be directly or indirectly thematized.

e.g. "Do you want to be here till tomorrow or why are you asking."

Evaluating: Structuring by differentiation with regard to

the presumed value of an action part.

e.g. "The most important point is not to lose the overview."

**ASSURING UNDERSTANDING:**

Direct question.

e.g. "Do you follow me?"

Interpretative question.

e.g. "Shall I explain it more precisely?"

Circumscribe. To repeat the sentence just spoken in alternative words.

**MOTIVATING:**

Remarks concerning beliefs with regard to the propositional characteristics of the instruction and to the actual presentation of the relevant action sequence.

e.g. "We have said enough about blood, now let's go on to the lungs."

The "expert" speech acts of the 18 instructional dialogues were categorized into these five speech act patterns. On the background of our assumption that experts as problem solvers try to find the right operators as means to the end of a successful instruction, we expected a certain analogy results from the propositional analysis: the illocutions should be changed from one speech act pattern to the other as a consequence of the novice's questioning. This analogy was possible to find. In each case the speech act pattern which could be identified

before a question, would be changed in a systematic way after the question had been asked: after questions within a DESCRIBING sequence we found speech acts of the STRUCTURING and REASONING types, but never any other type; after questions within a STRUCTURING sequence we found speech acts of the REASONING and of the DESCRIBING type, after questions within REASONING sequences we found DESCRIBING speech acts and sometimes speech acts of the MOTIVATING pattern. All together the most frequently produced speech acts after questions, were of the REASONING type. These results indicate again that the instruction activity within a dialogue, can not be described as an automatic or partly automatic process of displaying some expert knowledge in a manner which is independent of the actual novice. In contrast, the expert is reacting directly to the signals s/he receives from the novice. This holds true for the very restricted dialogue within which the novice is only allowed to pose some very simple questions like in our empirical situation, and it will also be valid also for the more complex "real-life"-dialogues.

The theoretical framework of our studies includes the assumption that dialogical speech in instruction situations is the result of a problem solving process. Unlike other cognitive processes which are described in the textbooks of cognitive psychology, this process is dynamic and complex because it refers to the carrying out of a speaking activity in which a larger piece of knowledge has to be presented in an adequate and, with regard to the novice, sensible way. As such, the expert finds her/himself in a

dominant position. First of all s/he has to refer to the hierarchically organised action and find the right degree of detailing and the adequate pattern of speech acts. In the course of the instruction, the instructor has to go from an initial state to a final state and the novice has to move from no-knowledge to knowledge. The dominance relation within this situation determines that the expert is the leading problem solver, as s/he has to show the way and to adjust to the novice. In playing this role, specific problem solving strategies are used, strategies which in general psychology have been described as particular modes of thinking. In the context of our research they appear as strategies of goal directed acting in the dialogue.

The novice however, has to take what s/he gets from the expert and also has to adjust. Both the expert and the novice are in a constructive interaction, the success depending upon both participants. If the expert does not act in an adequate way, then the novice can not be effective. If the novice can not really construct the mental model, then the instruction is also inefficient. Thus the reciprocal recognition of the asymmetry in expert-novice-dialogues involves the recognition of a mutual dependence upon one another.



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"Sprechen und Sprachverstehen im sozialen Kontext"

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