PROTOCOL ANALYSIS AS A METHOD TO STUDY DISCOURSE PROCESSES

RESUME

L'article présente une méthode encore peu connue dans le domaine des communications : l'analyse de protocole. Cette méthode est pourtant idéale pour analyser les processus du discours, par opposition au contenu du discours.

SUMMARY

This article presents a method little known in the field of communications called protocol analysis ; this method is ideal to analyze the processes of discourse, as opposed to the contents of discourse.

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By Francine HOULE
Ph. D. Student
Université de Montréal.

Most methods of discourse analysis study the *content of a message or its effect;* for example, one may be interested in the number of times a particular group of people has been mentioned in the past in various newspapers; or, one may survey radio listeners on their reactions to certain types of programming. Very few methods deal with the *processes* of encoding (sending) or decoding (receiving) a message. Recently however, researchers in the field of communication, particularly on the American continent, have been increasingly interested in the covert cognitive processes which act within the receiver (or sender) as he decodes (or encodes) a message. Traditionally such covert processes were investigated by modifying a particular stimulus in the message and, noting the effect on the receiver, subject's responses were attributed to processes «thought» to underlie the particular response. This «cause-and-effect» logic on the part of the researcher resulted in little worthwhile information about the true cognitive processes present between the presentation of the stimuli and the subsequent response.

Cognitive psychologists have devised another approach, a generally *non-interventionist* method, to study covert processes involved in all types of «problem-solving» (1).

This method is called «protocol analysis» because it is based on data called «protocols» : ***a set of sequences or steps, ordered in time, taken by subject to solve a problem.***

TYPES OF PROTOCOL

There are «motor protocols», «visual protocols», and «verbal protocols» ; the choice of the type (s) of protocol best suited to the task observed is left to the researcher :

Motor protocols are a set of physical steps, ordered in time, taken by a subject to solve a problem ; for example, a child trying to fit various containers one into another, would pick up one container and try it, or compare two containers, or remove one that is already in place, etc.; in mass-media studies in America, where viewers have access to dozens of channels, one may wish to record the event taking place during a television program on a certain channel and the corresponding actions of the viewer equipped with a remote-control.

Visual protocols are those where the researcher observes the eye movements of a subject performing a task; for example, given magazine ads, which part of the ad would attract attention first or the longest.

Verbal protocols, by far the most often used, alone or as a complement to the other two, are of several types :

1) They may be «think-aloud» protocols, thoughts expressed by the subject as he is performing some task: for example, a subject decoding a censored text would verbalize how he is retrieving the hidden information. The trick for the researcher here is to minimize his interventions by providing quiet cues to remind the subject to think aloud; a possible disadvantage is the fact the the very act of thinking aloud may modify (positively or negatively) the outcome of the task.

2) They may be «introspective» protocols, explanations given by the subject after completion of the task on the different steps taken; for example the subject having arrived at a solution explains which steps he took; this of course removes any interference from the researcher and influence on the task. However, it is sometimes difficult for subjects to report accurately on the rules they used, particularly if they are experts and use rules automatically.

(1) We note that by a «problem» we don't necessarily mean a mathematical problem, but other tasks as well such as decoding a text or an illustration, obtaining information during interviews, making a diagnosis, interacting socially, comparing experts and non-experts, etc. Applications in the field of communications abound, not only mass communications, but also interpersonal, intercultural, organizational and human-computer communication.

3) They may be discourse protocols, where the words are the actual objects of study; we could study tapes of conversations such as interviews where one person must keep control of the conversational flow in order to obtain some type of information.

ANALYZING PROTOCOLS

When analyzed, intuitively or statistically, these sequences of steps (verbal or otherwise) enable us to make inferences about the cause of the subject's response to a particular state of the problem and thus provide us with information about the processes that may have mediated the response. From there we may build a descriptive model of the processes used by the subject.

Typically then, once one has a protocol, it must be transcribed and coded in basic units (for verbal protocols these could be *speech acts (Searle 1969)* as in the case of interviews, or *thoughts* which are statements expressing one ideal). These units can then be categorized and perhaps assigned a value. For example, speech acts can be grouped according to the intent of the act: questions, assertions, suggestions, etc and ideas may be categorized according to subject, or goal, or type of knowledge base used, depending on the problem being studied.

A short historical note : according to Ericsson and Simon (1985), the first researcher to use verbal protocols in an attempt to explain problem-solving was J.D. Watson in 1920 (British J. of Psychology 11, 87-104); but his work and others during the following fifty years were generally of an exploratory nature and had very little theoretical support. Newell and Simon (1972) were the first to actually propose models describing the problem-solving processes of a human being with the hope of simulating them with a computer. They viewed the subject as an «information processing system»: during «think-aloud» protocols, the subject first assesses the state of the problem at a particular time, decides to use a particular operator which would allow him to find a new information, and again assesses the new state of the problem (how close he is to a solution) before making a decision to use a particular operator, etc, until the problem is solved. A «behaviour graph» or «descriptive model» of the subject is then simply a series of pairs «state of the problem — operator» such as this :

TIME STATE OF THE PROBLEM OPERATOR

Certain rules may then be extracted from the graph such as «when the state of the problem is St, then the operator Xt must be used to have effect St+1».

Behaviour graphs offer great potential in informatics and didactics. Using the behaviour graph of several subjects faced

with the same problem, one may be interested in finding the optimal graph, that is, the one which will arrive quickest at a solution to the problem (the «expert way»), the one where no backtracking is necessary, no unnecessary steps; ideally this optimal graph is such that a digital computer may use it to simulate the human in solving such a problem. For example, computers may then be «taught» to play chess, or arrive at a diagnosis given different symptoms.

Certain inference rules used by the subject may be expressed outright by the subject during the «think-aloud» or «introspective» protocol («the patient has a fever so he must have an infection»), or may be extracted from the coded protocols through some type of statistical analysis when a sufficiently large number of cases are available. In one study by Houle (1988), taped interviews of nurses answering the emergency line of an ambulance service were coded and analyzed according to this method: one rule which was found was that in all cases where a patient's anxiety was excessive, the nurse refrained from using «interruption» speech acts: «if anxiety is high then do not interrupt». Similarly, it was found that the use of a certain operator (the «reassurance» speech act) always resulted in a decrease in anxiety in the patient. Such findings are then used to train new nurses who must communicate by phone with patients in emergency situations.

CONCLUSION

The method is quite versatile since one may construct unique models of individual subjects, or a summative model of many subjects, or comparative models of two subjects or two types of subjects according to the goals of the research. In spite of the above-mentioned misgivings about this method (see Nisbett and Wilson 1972) and even though the protocol is an incomplete record of the mental steps taken by a human being in solving a problem, it is nonetheless a very rich record, we may complete it with our knowledge of the nature of the task and of human capabilities to infer from it a model of the underlying psychological processes by which the subject performs the task.

This method adapts itself very easily to the goals of the researcher, as long as the phenomenon observed is of a sequential nature; if the number of subjects permits, frequency analysis and sequential analysis may be applied. The decoding or encoding processes of the receiver or sender of a message are perfect examples of studies which lend themselves to the use of this method in the field of communications, whether this message be transmitted personally or through mass communications.

F. H.

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