

GENERAL INTRODUCTION

A definition of writing and a presentation of the main models

1 WRITING A TEXT: A COMPLEX TASK

1.1 To elaborate a content, to write it, and to modify it

Writing a text is a complex task that needs a coordinated implementation of a large set of mental activities. Writers have to clearly delimitate the nature, the goal and the communicative function of the text. They also have to establish a precise representation about readers' characteristics and expectations, in order to anticipate systematically what must, or can, be written. Writers have equally to control the text topic so as to generate or to specify the most relevant ideas that will progressively constitute the text content. In addition, they must sometimes clarify the message, reorganise, modify and articulate ideas, while controlling the whole text coherence.

Surrounding, delimiting and adapting the text content constitute an important writing phase. In addition, it is also necessary to put ideas into words, that is to formulate them, throughout the writing process. This activity does not mean to simply copy out some words or an isolated sentence, but to clearly formulate a set of coherently articulated sentences, without any redundancy or, conversely, without too many thematic ruptures. To realise these operations, it is necessary, at least, (1) to choose the 'appropriate words' for each idea, (2) to use very strict syntactic, grammatical and orthographic rules, (3) to use correct punctuation and connection marks, in order to translate, in terms of linguistic relations, the semantic relationships linking these ideas.

These mental activities are still not sufficient to elaborate a text. A satisfactory text is only very rarely produced during the first trial. It is often the result of an important number of drafts, corrections, scratches, additions, and so on. These successive versions can certify both surface modifications, such as orthographic corrections, and deeper modifications, such as the reorganisation of the text organisation. To correct or to modify a text supposes that the writer can evaluate the quality and the pertinence of her/his own production. S/he has to read what has been written, during all the writing process, in order to be able to continue to write as well as to modify the previous text.

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1.2 To manage writing constraints

There is no optimal method to conceive the text content, to elaborate its linguistic form, to revise its content or its form and, consequently, to activate and to articulate these three activities throughout the writing process.

The writer must take into account a great number of clues that come from, for example, the writing context, imposed or posed goals, the state of writing, the text already produced, *etc.* This set of clues can represent as much constraints as the writer has to understand and to use in order to manage the necessary mental activities during writing and to control their efficiency. In other words, the writer has to elaborate an efficient writing strategy.

However, these clues do not constitute the unique constraints for the choice of a strategy. The writer's capacities to simultaneously operate a more or less important number of mental activities can equally play a central role. For example, the most or less important limitation of processing capacities can constrain the writer in the choice of appropriate mental activities, and perhaps in the activation of these activities. Thus, a writer not being able to think about the text continuation while writing, must frequently alternate phases of content research and phases of handwriting.

When we look at this great number of mental activities to be realised, managed and controlled, answerable to external as well as internal constraints, it is easy to understand that the writing expertise could only develop very slowly in children, and sometimes even to be very approximate in adults. To write good quality texts, both linguistically and semantically, requires from the writer a lot of practice, training and technique. Thus expertise certainly needs (1) the activation of writing strategies more complex than those generally used by novices, (2) the possibility to simultaneously manage a greatest number of constraints, and/or (3) a sufficient writing practice to automatise letter transcription or spelling rules.

1.3 Text production: a possible definition in the context of cognitive psychology

The diversity of mental activities of text writing implies that its study is both attractive and difficult. The text production activity can thus be very relevant and interesting for cognitive psychology because it supposes the activation of a great number of processes, that do not only concern verbal production, but equally reading and comprehension. In this view, the study of text production offers the possibility to analyse the functioning of numerous mental mechanisms that have often been defined and studied in isolation in other psychology areas. It is thus possible to study the conditions of process activation and interaction, processes ensuring, for example, (1) content retrieving and planning, (2) information encoding and maintaining in Working Memory, or (3) text reading and understanding, in very specific contexts.

From a cognitive viewpoint, we think that text production can be defined as a finalised and complex activity, because it supposes to process, by the implementation of several mental processes, and with a general goal – to write in order to communicate, for example – a great amount of knowledge. Thus, writing a text can be compared to a problem-solving situation whose resolution implies complex cogni-

tive activities and abilities. In such a problem-solving context, the resulting product – the written text – requires at least the uses of four types of knowledge: (1) Domain knowledge (the conceptual domain to be expressed in the text), (2) Linguistic knowledge (grammatical rules and lexical items that compose the text), (3) Pragmatic knowledge (that allows the writer to adapt for the addressee the conceptual content as well as the linguistic form of the text), and (4) Procedural knowledge (in order to use the three preceding types of knowledge and to strategically process them).

A general writing process fulfils the processing of each of these kinds of knowledge. This process ‘transforms’ the domain knowledge into a (necessarily) linear linguistic product, which must comply with a specific communicative goal. Due to the limited processing capacity of the cognitive system, the global transformation process is progressive and subdivided into a given number of sub-goals (*i.e.*, to elaborate, to write, to modify, *etc.*). Each sub-goal is realised by series of specific processes (*i.e.*, ordered sequences of mental operations) which are controlled by procedural knowledge (*i.e.*, knowledge for the application of processes).

1.4 *Some models to delimit and to define the necessary processes and knowledge*

It is easy to understand, while reading this possible definition of text writing activity, that researchers’ important difficulty is to be able to identify, to study and to integrate, in a complex system, these different mental mechanisms (*Cf.* Hayes, 1989). The complexity of this system is such that it is not possible to try this integration without using a *model* in order to delimit, to surround and to *a priori* define processes, knowledge and modes of processing necessary for the production of a text. The term of model is here considered as a blueprint, a simplification, or an outline. Text writing models allow researchers to focus on some dimensions of the writing task, without forgetting that these dimensions belong to a complex system. Mainly prospective, these models propose a relatively precise and analytic definition of the writing activity, both concerning the process architecture (in terms of arrangement of these processes in models as well as in terms of definitions of sub-processes or operations that compose the processes) and functioning (in terms of process management rules, control and activation in Working Memory). These models lead to a great number of experimental studies, but have still not reached a sufficient level of formalisation in order that a computer simulation, for example, could be possible.

1980, 1987, 1989 and 1996 represent four very important years for those cognitive psychologists who are interested in text production activity. It is in 1980 that Hayes and Flower published the first general model of text writing. After that, Bereiter and Scardamalia elaborated the first developmental writing model, in 1987. Two years later, in 1989, Levelt proposed a very precise modelisation of speaking activity that has greatly influenced models and works in the area of writing. Finally, 1996 is a prominent year. It corresponds to the modification, by Hayes, of the initial Hayes and Flower’s model, and to the publication, by Kellogg, of a model of text writing articulating processes and Working Memory, as conceived by Baddeley (1986).

2 THE MAIN MODELS OF VERBAL PRODUCTION

2.1 1980: Hayes and Flower's model

Hayes and Flower's model has been published in a collective book entitled '*Cognitive processes in writing*', edited by Gregg and Steinberg in 1980. It is probably one of the first books standing up for a cognitive approach to writing. The model elaborated by Hayes and Flower is presented in two successive chapters in this book. The first chapter, entitled 'Identifying the organisation of writing processes' proposed a description of writing processes and architecture while a second chapter, entitled 'The dynamic of composing: Making plans and juggling constraints', written by Flower and Hayes, rather focused on the functioning of the model, in terms of constraints linked to the activation of processes.

On an architectural viewpoint, the model of Hayes and Flower (1980) is composed of three main parts: the Task Environment, the writer's Long Term Memory, and the general writing process (Cf. Figure 1).

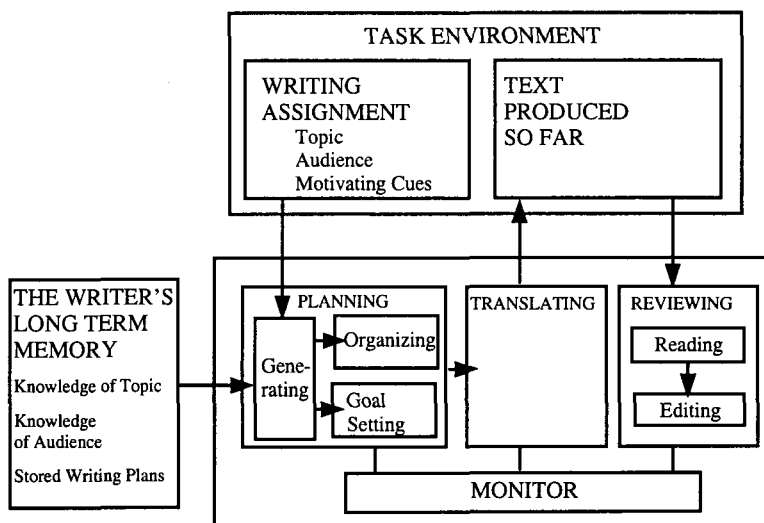


Figure 1: Hayes and Flower's model, adapted from Hayes and Flower (1980). Copyright © 1980 by Lawrence Erlbaum Associates. Adapted with permission.

The 'Task Environment' comprises all that is outside of the writer and can influence the performance. This environment is composed of:

- some writing instructions that determine (1) the general theme of the text to be written (Topic); its communicative goal (Audience), and (2) some motivational factors deriving from the writing situation (Motivating Cues),

- the text, gradually written (Text produced so far), that is going to be used as a reference for the writer, in order to progress as well as to revise the already written text.

The 'Writer's Long Term Memory' contains three knowledge areas concerning:

- the general text topic (domain knowledge – Knowledge of topic),
- the communicative act (pragmatic knowledge – Knowledge of Audience), and finally,
- linguistic knowledge about specific text plans, for example, story grammars (Stored Writing Plans).

The general writing process is composed of three processes that allows to transform domain knowledge in a linguistic product (with their sub-processes and/or associated operations) and a process of control. These processes are:

- the 'Planning' process with three sub-processes: 'Generating', 'Organising' and 'Goal-Setting',
- the 'Translating' process,
- the 'Reviewing' process, with the sub-processes of 'Reading' and 'Editing',
- the management and control process, called 'Monitoring' and that defines the order of activation of the three preceding processes.

More precisely, the main function of the Planning process is to establish a writing plan from (1) domain knowledge retrieved from Long Term Memory, and (2) information extracted from the task environment. This plan guides text writing by defining the main goal and the sub-goals. As seen above, this plan can also be retrieved from Long Term Memory, if it has been stored among the writer's knowledge (Stored Writing Plans). Otherwise, it has to be built through three sub-processes: the retrieving (Generating) of the different pieces of knowledge stored in Long Term Memory; their organisation (Organising) in a writing plan, and the elaboration of criteria that will allow to judge the appropriateness between the written text and the intentions (Goal Setting).

The Translating process runs under the control of the writing plan and translates domain knowledge in language. According to Hayes and Flower (1980), the functions of this process are: (1) to retrieve, from Long Term Memory, complementary knowledge allowing (2) to develop each part of the writing plan before (3) translating the retrieved propositions in correct sentences (by means of lexical and grammatical processing).

Finally, the Reviewing process evaluates the appropriateness between the written text and the linguistic, semantic and pragmatic particularities of the writing goal. Two sub-processes carry out the revising activity: the analytical reading of the already written text (Reading) and its possible correction (Editing).

These three processes are managed by a control process – Monitoring – whose function is, among others, to regulate the recursion of their application.

The methodology adopted by the authors, to elaborate and validate this model, involved a verbal protocol analysis that was developed by Newell and Simon (1972) to study problem-solving processes. Although elaborated only on the basis of the protocol of one unique participant (speaking about his mental activities during ex-

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