



Effects of planning strategies on writing dynamics and final texts[☆]

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ABSTRACT

Expert writing involves the interaction among three cognitively demanding processes: planning, translating, and revising. To manage the cognitive load brought on by these processes, writers frequently use strategies. Here, we examined the effects of planning strategies on writing dynamics and final texts. Before writing an argumentative text with the triple-task technique, 63 undergraduates were asked either to elaborate an outline with the argumentative structure embedded (structure-based planning condition), to provide a written list of ideas for the text (list-based planning condition), or to do a non-writing-related filler task (no planning condition). Planning showed no effects on the length of the pre-writing pause and cognitive effort, but influenced writing processes occurrences. Compared to participants in the no-planning condition, those in the planning conditions showed a later activation of revising. Moreover, participants in the structure-based condition were mainly focused on translating in the beginning and middle of composition, whereas their peers tended to distribute their attention among all processes. Planning ahead of writing also resulted in texts with longer words, produced at a higher rate. Only the structure-based planning strategy led to an increase in the number of argumentation elements as well as in essays' persuasiveness and overall quality. There was, however, no indication that these improvements in final texts were associated with changes in the dynamics of writing. Overall, the use of structure-based plans seems to be an effective and efficient way of improving undergraduates' argumentative writing.

1. Introduction

Most current cognitive models of writing largely agree that skilled writing entails three cognitive processes, namely, planning, translating, and revising (Berninger & Swanson, 1994; Berninger & Winn, 2006; Hayes, 1996; Hayes & Flower, 1980, 1986; Kellogg, 1996). *Planning* involves the formulation of task goals along with the generation and organization of ideas. *Translating* refers to the conversion of ideas into linguistic forms in working memory, which are then externalized in the form of written text through transcription processes, involving the retrieval of orthographic symbols (i.e., spelling) and the execution of motor movements to produce them (i.e., handwriting/typing; Abbott & Berninger, 1993). *Revising* encompasses the monitoring, evaluation, and changing of the intended and actual written text. These resource-demanding processes interact with each other (Beauvais, Olive, & Passerault, 2011; Hayes & Flower, 1980) and impose heavy demands on writers' limited working memory capacity (Kellogg, 1996, 1999; Olive, 2014). As exceeding this capacity may have a detrimental effect on writing performance, writers ought to manage the cognitive load during writing to produce good texts. Such management is reflected on the

dynamics of writing (i.e., cognitive effort and distribution of writing processes) and is likely to influence the characteristics of final texts (Beauvais et al., 2011).

One solution to manage cognitive load effectively and improve final texts consists of reducing the overlap between processes during text production and using strategies to support their enactment (Fayol, 1999; Kellogg, 1994; Torrance & Galbraith, 2006). Planning strategies – implemented before writing to support the planning process – seem to be particularly beneficial for beginning and developing writers (Graham, McKeown, Kiuvara, & Harris, 2012; Graham & Perin, 2007). Still, little is known about their positive effects in undergraduates. This was the main purpose of the present study, in which we examined and compared the effects of planning strategies on the dynamics of writing and on a large set of characteristics of argumentative texts.

1.1. The role of planning in good writing

As writing is a goal-directed activity, goal setting is a critical component of planning (Hayes & Flower, 1986). The formulation of content and rhetorical goals provides clear information about task requirements

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and directs writers' attention towards them. Another key function of planning is generating content (Torrance, Thomas, & Robinson, 1999). Writers plan their text by extracting information from the task environment and by searching for content in their long-term memory. When necessary, this generated material is (re)organized in a written plan that will guide text production (Hayes & Flower, 1986). There is now considerable evidence associating good writing with the use of strategies to support goal setting as well as ideas generation and organization.

The use of elaborated goals tailored to a specific genre seems to be beneficial for argumentative writing. Prior research showed that providing school-aged or undergraduate students with sub-goals for considering major argumentation elements – such as providing and justifying arguments, and considering and rebutting counter-arguments – had a positive impact on the quality of written arguments, promoted the exposition and rebuttal of alternative positions, and increased overall essays' persuasiveness (Ferretti, Lewis, & Andrews-Weckerly, 2009; Ferretti, MacArthur, & Dowdy, 2000; Nussbaum & Kardash, 2005). The great advantage of these type of goals seems to be the explicit evoking of the schema underlying argumentative writing. By prompting the inclusion of key argumentation elements in the text, goals may help writers to apply their knowledge of argumentative discourse, which may serve as a cue for retrieving and reporting relevant information (Coirier, Andriessen, & Chanquoy, 1999).

Another sophisticated and effective form of planning is outlining (Limpo, Alves, & Fidalgo, 2014; Piolat & Roussey, 1996). This involves noting ideas in a well-ordered hierarchy of structural relations. Although only a handful of studies examined the association of outlining with undergraduates' writing, their results are consistent: Outlining increased text quality (Galbraith, Ford, Walker, & Ford, 2005; Kellogg, 1987b, 1988, 1990). As proposed by Kellogg (1994), the advantageous effects of outlining can be explained by two sources: organization of ideas and restructuring of the writing process. First, outlining allows writers to generate and organize ideas in a hierarchy of structural relationships as well as to come up with an action-plan to guide the development of those ideas in the composition. This claim is supported by research showing that planning strategies lacking the organizational and hierarchical component underlying outlining (e.g., clustering) failed to improve text quality (Kellogg, 1990). Second, by separating planning processes from text production, outlining may also reduce writers' need to plan during writing. Consequently, writers may be able to focus more on translating and revising processes, which can be carried out more effectively. Though less empirically supported than the first claim, this second one is mostly grounded on studies examining outlining effects on writing dynamics.

In adult writers, the effects of setting genre-specific goals and elaborating outlines have been studied separately. Nevertheless, intervention studies with school-aged writers have shown the advantages of combining these two planning procedures. Actually, teaching genre-tailored planning strategies is among the most effective ways to promote writing (e.g., Harris, Graham, & Mason, 2006; Limpo & Alves, 2013b, 2017; for meta-analyses see Graham et al., 2012; Graham & Perin, 2007). Typically, students are given structure-based graphic organizers with empty boxes matching the main elements of a specific genre (for graphical examples, see Harris, Graham, Mason, & Friedlander, 2008). These graphic organizers guide students in the process of generating ideas according to the text structure, and in organizing those ideas hierarchically. The effects of this structure-based form of planning not only increased discourse measures of writing performance (e.g., text quality and genre elements), but also enhanced sentence- and word-level aspects of composition (Limpo & Alves, 2013b). Such a result is interpreted as planning ahead of writing allowing writers to concentrate on translation-related aspects during writing. Because these intervention studies usually taught the structured-planning jointly with self-regulation procedures (Graham & Harris, 2007), little is known about its unique contribution to writing,

particularly in older writers. However, there is evidence that providing ninth and tenth graders with an electronic outlining tool specifying major argumentation elements was enough to raise qualitative features of students' texts (De Smet, Brand-Gruwel, Broekkamp, & Kirschner, 2012; De Smet, Brand-Gruwel, Leijten, & Kirschner, 2014).

A word of caution is needed as planning is not a panacea for all difficulties faced by writers (Galbraith, 1999; Kellogg, 1994). Indeed, greatly structured forms of planning may not be effective for writers who prefer to plan during writing (Baaijen, Galbraith, & de Gloppe, 2014), or in situations where writers either do not need extensive pre-planning (e.g., short stories) or have no clear ideas on the topic (Kellogg, 1990).

1.2. Study of writing dynamics

The expression “writing dynamics” is used to denote two critical aspects of text production: the recursiveness of writing processes as well as the cognitive effort associated with these (Olive, Kellogg, & Piolat, 2002). A particularly suitable and powerful method to study these two aspects of writing is the triple-task technique. This technique was first used by Kellogg (1987a, 1987b), and further refined by Olive et al. (2002). It allows the analysis of the temporal organization of writing processes along with the cognitive effort allocated to each process. The procedure calls participants to perform three tasks: composing a text, detecting random auditory probes, and categorizing the mental process at the time of the probe (i.e., directed retrospection), according to previously learned categories (viz., Planning, Translating, and Revising; typically, there is another category for unrelated thoughts, labelled Other). Categories occurrences provide reliable estimates of how much planning, translating, and revising is carried out during composition. Reaction times (RTs) to auditory probes provide reliable indices of the cognitive effort of the process interrupted by the signal. To isolate the cognitive effort associated with writing from that of detecting the signal, the final RT is computed by subtracting each participant's RTs from the mean baseline RTs. This latter measure is obtained from a prior session, where participants perform the auditory signal detection only. The longer the interference in RTs, the higher the cognitive effort associated to the process. (Kahneman, 1973).

The triple-task technique has raised some questions on its reactivity and validity (for a review, see Olive et al., 2002). It has been suggested that the process and output of text production could be disrupted by either the frequent interruptions prompted by the RT task or by the time taken to label the ongoing process – which is actually very brief, happening 2–3 s after the interruption. However, several studies comparing texts produced by writers using the triple-task technique with writers uniquely writing or only detecting RTs while writing, indicated that this procedure does not disrupt writing (Kellogg, 1987b; Penningroth & Rosenberg, 1995; Piolat, Roussey, Olive, & Farioli, 1996). Except reducing writing fluency (i.e., number of words per minute), this technique neither influenced writing dynamics nor the characteristics of the final texts. At least two major concerns on the reliability and validity of the directed retrospection have also been raised. A first concern is the extent to which writers' categorizations provide valid insights into their own cognitive activity. On this point, Kellogg (1987b) observed substantial agreement between writers' categorizing their own verbal protocols and a trained judge categorizing the same report. Moreover, it was shown that writers' metacognitions about how they compose do not influence the pattern of responses (Levy & Ransdell, 1995). A second concern on the directed retrospection procedure relates to the use of three or four pre-determined categories to characterize cognitive activity during writing. Compared to thinking-aloud protocols – in which writers verbalize their thoughts as writing unfolds – this procedure seems less disruptive of the composing task. Still, it is also less informative in detailing the dynamics of writing and may provide a biased picture of it. Indeed, some writing processes are extremely complex and difficult to classify into few

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