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Electronic outlining as a writing strategy: Effects on students' writing products, mental effort and writing process

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ABSTRACT

This study addresses to what extent and how electronic outlining enhances students' writing performance. To this end, the focus of this study is not only on students' final writing products but also on the organisation of the writing process (i.e., planning, translating, and reviewing) and perceived mental effort during writing. In addition, effects of repeated electronic outlining were examined. A combined within and between subjects design was implemented in which 93 10th-grade students wrote two argumentative texts with or without using electronic outlining. Analyses showed that using electronic outlining for planning and writing significantly improved the presentation of the argumentative structure. However, effects were less clear for correctly and completely establishing a text structure and no effects were found on the elaboration of students' argumentation. Process data showed that electronic outlining increased total process time, but no effect was found on students' overall planning and revision activities. Finally, self-reports showed no effect of electronic outlining on students' perceived mental effort. Nevertheless, repeated use of the same writing strategy enhanced writing fluency.

1. Introduction

In the current knowledge-driven society, writing elaborated and coherent texts is an important skill for both one's educational and professional career (U.S. Department of Education, 2003). The development of students' writing skills is therefore an explicitly formulated educational goal. At the same time, writing is a complex and demanding skill to master (Flower & Hayes, 1980; Hayes, 1996; Kellogg, 1994). The complexity of writing can be explained by the fact that writers must simultaneously perform a set of distinctive cognitive activities. During composition, writers must simultaneously plan, translate, and review their text; they should consider a content problem of what to write, and a rhetorical problem of how to express their ideas in a way that suits both the topic and the audience (Flower & Hayes, 1980; Lindgren & Sullivan, 2005; Torrance, Thomas, & Robinson, 2000).

The alternation of these cognitive processes puts a heavy load on a writer's working memory. Empirical studies by Kellogg (1996) and Baddeley (2010), have shown that this working memory has only limited capacity to process and store information. Writers, therefore, often experience cognitive overload while composing a text and may be unable to adequately attend to any of these processes at all (Flower & Hayes, 1981; Kellogg, 1988). Such writing may be inefficient and might lead to poorly structured and/or incoherent texts. Kellogg (2008) showed that the efficiency of writing is affected by expertise as certain processes become automated with expertise (i.e., they no longer require cognitive processing). Moreover, expert writers make use of well-developed writing strategies to enhance their writing. Different studies have shown that these writing strategies, in particular outlining, may improve students' writing products and decrease mental effort during writing (e.g., Erkens, Kanselaar, Prangsma, & Jaspers, 2002; Kellogg, 1988, 1990; Kozma, 1991). However, until now, not much is known about how these effects are achieved. To understand how outlining exerts influence on writing, the three main components of the writing process – planning, translating, and reviewing – serve as a starting point in this study. The purpose of this study is to examine the effects of electronic outlining on students' organisation of the writing process and its influence on students' writing products and perceived mental effort.

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Traditionally, many studies have focussed on whether writing strategies work, but not on how they are used and how they work. Understanding how electronic outlining is used and how it affects the organisation of the writing process is an important first step which may help to fill this gap and begin to provide a deeper understanding of how and why electronic outlining works. Understanding what works in electronic outlining may subsequently help indicate where teachers can and should provide extra support in writing education. This is an important step towards developing effective pedagogical instruction for using electronic outlining in education.

1.1. The writing process

Since the early 1980's, emphasis in writing research shifted from the writing product to the writing process, focussing mainly on the cognitive processes involved in writing so as to unravel what happens in the writer's mind during composition (Flower & Hayes, 1981; Hayes & Flower, 1980). From then on, several researchers attempted to grasp the complexity of the writing process in a model.

The first and most prominent model is Hayes and Flower's (1980) cognitive model of the writing process which contains three main components: the task environment, the writer's long term memory and the writing process. Through the years, various revisions have been made of the initial Hayes and Flower model (Chenoweth & Hayes, 2001; Flower & Hayes, 1981; Hayes, 1996, 2012; Leijten, Van Waes, Schriver, & Hayes, 2014). However, as Hayes (2012) states, "despite its age, the [initial] model contains features that are still current in modern representation of writing" (p.370). For the purpose of this study, the writing process component from the original model is used as a theoretical base because it clearly distinguishes three subcomponent processes, namely planning, translating, and reviewing. This study focuses on the interaction between, and the management of these three subprocesses in the writing process.

Hayes and Flower's model makes clear that the writing process is not so much a linear process but much more a recursive cyclical one in which planning, translating, and reviewing may occur at any time. They constantly alternate and interact with one another throughout composition (Flower & Hayes, 1981). Regarding the alternation of the subprocesses, several researchers (Braaksma, 2002; Graham & Harris, 2000; McCutchen, 2000; McCutchen, Covill, Hoyne, & Mildes, 1994) used the term 'orchestration' to emphasise the temporal management of the writing processes and the fact that the subprocesses in writing can be activated and coordinated by the monitor.

Several studies (Beauvais, Olive, & Passerault, 2011; Berninger, Fuller, & Whitaker, 1996; Braaksma, Rijlaarsdam, Van den Bergh, & Van Hout-Wolters, 2004; Breetvelt, Van den Bergh, & Rijlaarsdam, 1994; Levy & Ransdell, 1995; McCutchen, 1988) have shown that the ability to manage and distribute the interacting subprocesses of writing is a decisive factor for both text quality and cognitive load. It might therefore be expected that writing performance can be enhanced by using writing strategies that help writers efficiently manage the different subprocesses during writing.

1.2. Writing strategies

Student writers, who are considered to be novice writers, may especially benefit from using writing strategies that help manage orchestrating the writing process (Kozma, 1991; Torrance, Thomas, & Robinson, 1994). The premise underlying this is that novices profit most from strategies that divide the writing process into separate stages, allowing them to focus effort on one single subtask a time, reducing the number of simultaneous constraints (Kellogg, 2008). In this study, a novice is defined as a writer who may have sufficient domain or genre knowledge but lacks process and procedural skills to effectively and efficiently write a coherent text. For these novices, little of the writing process is automated and therefore they must devote close attention to a variety of tasks and processes simultaneously (Flower & Hayes, 1981; Kellogg, 2008).

This study focuses on the effects of using a planning strategy which was expected to positively influence writing performance through not only organising but also generating content to set up an elaborated and structured text. In line with this, Olive and Passerault (2012) suggested that structuring ideas was important for generating new ideas. Also, Pouit and Golder (2002) found that in argumentative texts, students included more properties for the defended position when they drew up a list of ideas in advance. Finally, Walvoord et al. (1995) found that outlining was helpful for generating text.

1.3. Outlining as a writing strategy

Outlining is possibly the most recommended planning strategy for novices to enhance writing performance (Galbraith, Ford, Walker, & Ford, 2005; Hayes, 2006; Murray, 2011). An outline is a specific type of text plan drawn up by the writer before fully elaborating a text. It is a vertical list of items that is organised in the sequence which the writer intends to use for the final text, using one or more levels of hierarchy (University of Chicago, 2003; Walvoord et al., 1995). Outlining allows generating, clustering, and ordering ideas at an early stage in the writing process, and forces writers to consider both hierarchical and structural relations. Piolat and Roussey (1996) found that when students set up an organised list of ideas, the chronology helped them to linearise their ideas during the translation phase leading to essays with significant higher grades. Outlining can improve text quality because it shifts the writer's focus from a lower level of text-bound considerations to a higher, more structural level, leading to better structured texts (Kozma, 1991).

Outlining not only influences text quality, but according to Favart and Coirier (2006) the cognitive load induced during the writing process might be reduced when a text structure has been established in a prewriting phase. A written outline serves as an external representation of the plan and allows the writer to focus on non-planning activities during later phases of the writing process (Kellogg, 1988). Making a written outline prior to composing a full text could thus reduce cognitive load during writing (Collins & Gentner, 1980; Galbraith & Rijlaarsdam, 1999; Glynn, Britton, Muth, & Dogan, 1982).

1.4. Electronic outlining

Although outlines are traditionally set up with pen and paper, writers can nowadays profit from using electronic outline tools embedded in standard word-processing programs, such as MS® Word (Deacon, Jaftha, & Horwitz, 2004; Kozma, 1991; Price, 1997). These electronic tools enable writers to easily create outlines in which they arrange the sequence and subordination of their ideas. In this study, the use of