INTRODUCTION

Beyond the first few years in school, learners are expected to be able to write effectively across a wide range of disciplines and genres, yet learners seem to have difficulty achieving such a level of mastery (Ball, 2006; Korbel, 2001; Salahu-Din, Persky, & Miller, 2008). Despite this mismatch between expectations and observations, effective writing skills continue to be important in school, in the workplace, and, increasingly, in purely social contexts. To address this gap, many schools and universities have developed specialized interventions to help improve academic writing skills.
These range from providing writing support from peer or professional tutors or reviewers (e.g., Cho & Schunn, 2007; Nelson & Schunn, 2009), to providing explicit strategy instruction (e.g., Boscolo, Arfé, & Quarisa, 2007; Graham, 2006; Wallace et al., 1996), to requiring all students to take a single course focused on the basics of writing (see Carroll, 2002 for a critique of this approach), to integrating writing-intensive courses into the disciplines so students have multiple exposures to writing for different academic purposes (e.g., Burk, 2006; Defazio, Jones, Tennant, & Hook, 2010). However, given the volume of data generated, it can be difficult to assess the impact of such interventions (Duke & Sanchez, 2001; Melzer, 2009). Advances in technology may be able to help both with the task of helping learners to become better writers and with the goal of collecting and analyzing data on the impact of writing interventions on academic writing.

**WRITING PROCESSES**

Writing is a goal-directed activity that involves a range of interlinked cognitive processes (Flower & Hayes, 1981). In their seminal 1980 paper, Hayes and Flower (see also Hayes, 1996) introduced a cognitive process model of writing that acknowledged the complexity and recursion involved in the writing process. Hayes and Flower described writing as involving three major cognitive processes – planning, translating, and reviewing – and several sub-processes, each of which may come into play throughout the writing activity. Skilled writers often switch back and forth across all three major processes as they build and refine their texts. This natural switching complicates attempts to study writing by making it difficult to isolate individual processes. In this chapter, we provide a brief introduction to writing processes based on Hayes and Flower’s model and discuss how technology-enhanced approaches to writing instruction may help both writing researchers and student writers.

**Planning**

In writing, planning involves setting goals, generating ideas, and organizing those ideas to fit the goals. Winne and other self-regulated learning researchers have noted the centrality of goal definition in all learning tasks (Leacock, Winne, Kumar, & Shakya, 2006; Winne, 2001). The instructor typically provides some goal-related information as part of the assignment, but learners will use their own understanding of this information, along with cues from other external sources, such as peers, reference documents, or authentic contexts in which a particular learning activity may be taking place (e.g., a treasure hunt), to guide the generation of ideas (Klein & Leacock, in press). Thus, one way technology may help student writers is by assisting them to align their writing goals with those intended by their instructor so that the ideas they generate will be on-topic (Hadwin, Winne, Nesbit, & Kumar, 2005; Venkatesh, Wozney, & Hadwin, 2003; Zhou & Winne, 2009).

The organizing sub-process can take many forms. In some cases, the writer may be able to organize the ideas in his or her head, but more often in school-based writing, learners are asked to organize their ideas on paper or on screen via notes, outlines, or other pre-writing activities. Using such external artefacts can help writers manage the cognitive load associated with both holding multiple ideas in mind and experimenting with different organizational structures. Prior knowledge can also affect students’ ability to generate ideas and organize them (DeGroff, 1987). Because students are typically asked to write about topics in which they don’t yet have expertise, advances in technology have the potential to writers both by supplementing limited prior knowledge and by easing the working memory load associated with reorganizing ideas and comparing different structures (Winne, 2001; 2006). Finally, helping