



Exploring students' affect and achievement goals in the context of an intervention to improve web searching skills



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ABSTRACT

The present study assessed the effects of a short-term intervention designed to enhance students' web searching skills, particularly query formulation, information selection and credibility evaluation. The study also explored students' affective experiences during web searching and examined the influence of achievement goals on positive and negative affect. Using a longitudinal treatment/control design, 96 fifth and sixth graders searched for information on curriculum-related topics at four sessions. Positive and negative affect was measured before, during and after each search. Multilevel analyses showed that the patterns of change in searching skills differed across conditions, with experimental group showing significant growth throughout intervention in all searching skills, while the control group remained constant or worsened across sessions. Students also experienced high levels of positive and low levels of negative affect. Positive affect remained constant during and across sessions, while negative affect showed a quadratic trend during sessions and decreased slightly across sessions. Main effects of achievement goals on positive and negative affect were found only for mastery-approach goals. A mastery-approach by performance-approach goal interaction was found for negative affect.

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1. Introduction

In recent years the Internet has provided students easy access to enormous amounts of information. Although children have embraced this opportunity and they are increasingly using web to get information for schoolwork or leisure activities (Livingstone, 2003), they often lack the necessary skills to effectively use online resources, while few educational interventions have attempted to provide instruction and support to young children (Walraven, Brand-Gruwel, & Boshuizen, 2008). Students' affective states that naturally occur during online information searching appear to influence their overall performance and the cognitive strategies they adopt to complete the search task (Lopatovska & Arapakis, 2011). Although research on affect during online searching is limited (e.g., Bilal, 2000; Flavian-Blanco, Gurrea-Sarasa, & Orus-Sanclemente, 2011; Kuhlthau, Heinström, & Todd, 2008; Nahl, 2005; Wang, Hawk, & Tenopir, 2000), numerous studies have examined the role of emotion in different learning settings, i.e., in both technology-enhanced (e.g., D'Mello, 2013) and traditional contexts

(e.g. Artino & Jones, 2012; Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011; Shen, Wang, & Shen, 2009). Studies on naturally-occurring and experimentally induced affective states highlight the critical role of emotions for the regulation of cognitive processes such as attention, decision making, problem solving, and achievement (Blanchette & Richards, 2010; Isen, 2008; Valiente, Swanson, & Eisenberg, 2012).

Research has also established the critical role of motivation in traditional achievement settings for determining students' behavior, cognitive strategies, performance, and affective states (Linnenbrink & Pintrich, 2002; Pekrun, Elliot, & Maier, 2006; Wirthwein, Sparfeldt, Piquart, Wegerer, & Steinmayr, 2013). One of the most prominent motivational constructs, namely achievement goals, emphasizes the end results that students strive to attain. During learning, students seek to be competent (Elliot & Church, 1997). Thus, some students may be oriented toward learning and understanding new material, while others may be primarily interested in demonstrating competence and performing better than others (Harackiewicz, Barron, Tauer, Carter, & Elliot, 2000). In that respect, the primary reason why students engage in learning activities is either to *demonstrate* high ability or to *develop* ability for the task at hand (Brophy, 2010).

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The present study addresses the scarcity of research on the relationship between motivation and affect experienced by children who systematically engage in educational tasks involving assistive technologies (web-searching). Specifically, we monitored the trajectories of general (i.e., positive and negative) affect during performance of web-searching tasks in relation to students' preferred achievement goals. Moreover, a specific educational (learning) context was simulated through a systematic training program on web-searching skills and compared to a condition of free web search. The ultimate goal of the study was to contribute to a better comprehension of the emotional and motivational processes that operate during learning. A thorough understanding of how these processes interact holds the potential for building better learning environments (Pekrun, 2011) and helping students recognize and self-regulate their emotional states in adapting to new and complex learning situations. In the next section, we will first review existing research on the cognitive skills involved in web searching, focusing on elementary school students and including intervention programs aimed at skill enhancement. Then, we will present studies examining affective and motivational processes during web searching or, in the absence of relevant studies, in other academic contexts.

2. Research framework

2.1. Elementary school students and web searching

Students from a young age search the Internet for schoolwork-related information both at home and at school (Haddon & Livingstone, 2012; Purcell, Heaps, Buchanan, & Friedrich, 2013). During web searching they engage in an inquiry process involving numerous cognitive skills (Leu et al., 2011). Until recently, what we knew about web searching skills was largely based upon traditional research on print sources and texts. Yet, several researchers have argued that simultaneous, online searching and reading involves novel literacy practices (Coiro & Dobler, 2007; Leu, Kinzer, Coiro, & Cammack, 2004; Mills, 2010). Based on the few available studies on this topic, it appears that effective online searching and reading requires two distinct sets of skills, namely navigation and text processing skills (OECD, 2011). The former skills concern the ability to recognize and employ various navigation tools (e.g. scroll bars, hyperlinks and menus) and be familiar with heterogeneous textual structures and features (Rouet, 2006). Text processing, involves locating appropriate information, making relevance and credibility judgments and integrating information across multiple texts (Brand-Gruwel & Stadler, 2011).

Several studies have argued that the majority of elementary and middle school students have not mastered either set of skills adequately (Walraven et al., 2008). Thus, they often encounter difficulty in specifying appropriate keyword terms and use, instead, full sentences or natural language (Bilal, 2000; Kafai & Bates, 1997; Large, Beheshti, & Rahman, 2002; Schacter, Chung, & Dorr, 1998; Wallace, Kupperman, Krajcik, & Soloway, 2000), look for ready-made answers in online texts (Hirsh, 1999; Wallace et al., 2000), do not read in depth (Kafai & Bates, 1997; Wallace et al., 2000), and usually accept information without evaluating its accuracy or validity (Hirsh, 1999; Schacter et al., 1998). Previous evidence suggests that students with experience in web searching and other Internet activities are more successful in locating information, complete search tasks faster and are more thoughtful in their selection of credible sources of information (Bilal, 2000; Lazonder, Biemans, & Wopereis, 2000; Metzger et al., 2013; Tu, Shih, & Tsai, 2008). Another variable that has been investigated in the context of online searching is gender (e.g. Kafai & Bates, 1997; Roy, Taylor, & Chi, 2003). Although existing evidence suggests that boys and girls exhibit different search patterns (Large, 2005; Roy & Chi, 2003; Schacter et al., 1998), more recent studies do not support the impact of gender

in the search process (e.g. Kingsley, 2011). The role of gender in cognition is complex and understudied in the current context, and thus the issue remains unresolved.

Apart from gender and experience, age may influence search performance and the mastering of the constituent searching skills. As one would expect, children, teenagers and adults experience different problems during web searching (Large, 2005). Although older children have in general better searching skills (Livingstone, Bober, & Helsper, 2005), both children and teenagers encounter problems in specifying search terms, judging search results and deciding on source and information relevancy (Walraven et al., 2008). Also, it seems that some of the searching skills are acquired before others (e.g., in contrast to younger students, teenagers can adequately store relevant information).

A related issue is whether and how young students benefit from instruction targeting web searching skills (De Vries, van der Meij, & Lazonder, 2008; Kingsley, 2011; Kuiper, Volman, & Terwel, 2008). Among recent attempts in this direction, Zhang and Quintana (2012) created a software scaffolding tool for sixth grade students' inquiry projects supporting the different stages of web searching (i.e., planning, searching, analyzing, evaluating and synthesizing information) by using relevant prompts, facilitating planning and monitoring processes and providing computer-aided techniques for recording and citing information. Similarly, Kuiper, Volman, and Terwel (2009) focused their instruction on three sets of web literacy skills, namely web searching, web reading and interpreting and web assessment and evaluating of information. This successful training program was implemented in four fifth grade classes during a period of 10 weeks, with students searching online collaboratively and being supported by explicit instruction and guidance during their projects. Nevertheless, they applied skills inconsistently and irregularly during assignments, moving between newly acquired strategies to earlier, less effective ways of searching, reading and evaluating information.

Lastly, most published research to date has measured online searching at single time points, while limited studies to date have collected longitudinal data (e.g. Hirsh, 1999; Wallace et al., 2000) and only one has analyzed individual growth (e.g. Gerjets & Hellenthal-Schorr, 2008). As a result, conclusions regarding age differences rely mostly on cross-sectional data, which should make us cautious in drawing inferences about developmental processes (Kraemer, Yesavage, Taylor, & Kupfer, 2000).

The present study aimed to extend previous research in two ways. On the one hand, we attempted to capture the developmental change of web searching skills. As Paris (2005) suggested with regard to reading acquisition, the developmental trajectories of skills differ in terms of rate and duration of acquirement. Some skills are learned quickly, in relatively brief developmental spans, while others continue to develop throughout life (Paris & Hamilton, 2009). In a similar way, the component skills of online searching may grow at different rates. Keeping this in mind, we examined whether searching skills displayed distinct developmental trajectories, both within and across individuals, by measuring skills at multiple searching sessions (Hedeker & Gibbons, 2006). We also implemented a short-term training program targeting web searching skills of upper elementary students. Concurrently, we examined the influence of background variables like gender and web experience on the development of searching skills. On the other hand, apart from the cognitive dimensions of web searching, in the current research we examined the affective and motivational aspects of information problem solving.

2.2. Affect during web searching

What we know about school students' affect during web searching is largely based upon descriptive studies with small samples,

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