correspondences, but also higher level conceptual relations (Phillips & McQuarrie, 2004; Schilperoord, Maes, & Ferdinandusse, 2009; Teng & Sun, 2002)

.For our experiment we created 14 picture pairs, each consisting of a source, e.g. the leopard (either physically similar or dissimilar), and a target object, e.g. the motorcycle. The source objects were always natural objects (like a leopard, a giraffe, the sun, a hand), whereas the target objects were artifacts (like a motorcycle, a lighthouse, a clock, a computer mouse). The source and target picture were successively shown. When the source picture was presented, the participants had to call out as many things as came to mind within a 15 second time span. When the target picture was presented, they had to mention as many correspondences between target and source as they could within a 20 second time span. To control for any interference effects between the picture pairs, participants played a word-finding-game in between each picture pair.

The analyses focused on the number and type (attributive or relative) of predicates mentioned for the source and target, on the number of repetitions of predicates as compared to the source, and the number of explicit comparative expressions in the mentioned correspondences. Preliminary results show that physical similarity between picture pairs leads to more comparative expressions based on repetitions of relational predicates. For instance, when 'dangerous' was already mentioned for the leopard, we found more comparisons like 'the motorcycle and the leopard are both dangerous', when the motorcycle and the leopard were physically similar than when they were not.

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PAPER PRESENTATION

An intervention study on Mind Mapping skills and text processing in fifth and sixth grade

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Due to the exponential increase of knowledge in our information society, the need arises to support students in dealing with this information and engaging in self-regulated learning (SRL). This especially becomes essential from the age of 11-13, when children spend increasingly more time on learning from texts. The present study is embedded within the cognitive component of SRL, focusing on learning strategies and tactics students can apply for effectively processing, acquiring, and learning information. Working with graphic organizers, such as Mind Maps, seems promising in supporting students in this domain. This study addresses two main research questions by means of a repeated measures design in authentic fifth and sixth-grade classes (N = 62 students). We first focused on whether a positive evolution in Mind Mappings skills can be realised through a ten weeks during Mind Mapping intervention. Secondly, we investigated whether children make a significant progress in processing textual information by Mind Mapping throughout the intervention. The results of the repeated measures analyses reveal a significant evolution in Mind Mapping skills, indicating that Mind Mapping can be learned by fifth and sixth graders in a relatively short period of time. Children improve significantly in applying different Mind Map rules and in processing textual information in a Mind Map in a structured way.

Theoretical background

The exponential knowledge increase in our information society requires skills and strategies for realising efficient and effective processing and acquisition of information (Crick, 2007). In this respect, self-regulated learning (SRL) plays a growing role in educational research. SRL can be defined as a planned and cyclical way of regulating thoughts, feelings, and actions to meet personal goals (Boekaerts, Pintrich, & Zeidner, 2000) and includes a motivational, metacognitive and cognitive component (Zimmerman, 1990). The present research focuses on the cognitive component, referring to learning strategies and tactics students apply (Pintrich, 2004). The focus lies on cognitive processes and strategies for effectively processing and acquiring new information and linking it to prior knowledge (Cornford, 2002). In this domain, researchers call for approaches supporting children in processing, acquiring, and learning texts in a structured way (Novak, 2002). These skills play an important role, especially from the age of 11-13 when children spend more time on learning from texts (Rawson & Dynlosky, 2007). The use of graphic organizers, more specifically Mind Maps

(MM) (Buzan, 1974), seems promising in helping children in this respect (Vekiri, 2002). MM are typified by specific characteristics (e.g. dimensionality, colours, and images) determining the effectiveness of how well the text information is structured and learned (Buzan & Buzan, 1995). Several theoretical models underpin the use of graphic organizers, e.g. the Dual Coding Theory (Paivio, 1991) and Cognitive Load theory (Sweller & Chandler, 1994).

Research questions

We first focus on whether there is an evolution in Mind Mapping skills. Since it is important to respect the specific characteristics of MM determining their effectiveness, we investigate whether children significantly improve in applying the MM rules (Buzan & Buzan, 1995). Furthermore, we investigate whether children make a significant progress in processing textual information by using Mind Mapping.

Research method

Design. The study consisted of a ten weeks during intervention (one session of 50 minutes per week) in authentic classes and addresses the research questions by means of a repeated measures design (pretest, intermediate test, and posttest). In the intervention, children gradually learned how to Mind Map from a trained researcher.

Participants. A total of 62 primary school children of fifth and sixth grade participated in the study (4 classes from 2 different schools).

Instruments. The repeated tests consisted of independently making a MM of an informative text within 30 minutes. For each measurement occasion a different, but equivalent text was used. Afterwards, the characteristics and the quality of the collected 186 MM were scored. Therefore, an analytic scoring rubric containing two broad categories (‘shape and organisation' and ‘content') was used. Within these categories, subcomponents were identified based on the Mind Map rules (e.g. using a radial structure) and relevant content elements (e.g. relevance of key words) (Taricani & Clariana, 2006).

Data Analysis. The scores on the rubric were analysed quantitatively with One-Way Repeated-Measures Analyses of Variance.

Results

As to the first research question, a significant evolution was found on the use of capitals on the main branches and little letters on the other branches ($F(2,58)=8.754$, $pF(2,58)=5.609$, $p=0.006$). Further, the readability of the MM is significantly better ($F(2,58)=6.314$, $p=0.003$), keywords are better positioned ($F(2,58)=3.281$, $p=0.045$), and children make significantly more clusters at the end of the intervention ($F(2,58)=9.469$, $pF(2,58)=11.238$, p

As to the second research question regarding the processing of textual information in the MM, the children use significantly more information ($F(2,58)=82.990$, $pF(2,58)=14.397$, $p=0.000$). Words in a branch are better matched and associated ($F(2,58)=10.390$, $pF(2,58)=14.397$, $pF(2,58)=15.451$, $p=0.000$) and the children get overall better scores on their MM ($F(2,58)=125.468$, pFigure 1 illustrates the evolution of one participant's MM (pretest, intermediate, and posttest).

Significance of the research

The present study is significant for both educational research and practice. As regards the relevance for research, the study works on the existing gap in the current literature on effective approaches for supporting primary school children to structurally process and learn textual information. In this respect, the study enters upon an undeveloped research domain for this age group and might inspire other educational researchers to investigate the use of MM in primary school grades more thoroughly. As to educational practice, the present study demonstrates that elementary school children are able to learn to process informative texts by means of MM. Further, the results imply that by using MM in daily educational practice, teachers can stimulate and evaluate SRL-activities of children.

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PAPER PRESENTATION

Learning from Text with Instructional Pictures: Tracing Cognitive Processing Through Eye Movements

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This study first investigated whether an illustrated text would be more effective than a non-illustrated text in promoting a better learning performance. Secondly, it examined whether reading a text with a schematic picture or a text with a detailed picture would induce different cognitive processing, as revealed by eye movements, and learning outcomes.

As concerns the cognitive processing during reading, two fine-grained indices of eye movements were computed and used in the analyses: look-from fixation time to trace the integration of verbal and pictorial information, and look-back fixation time to examine the extent to which a particular area of interest was reinspected. Individual differences, such as prior-knowledge, reading comprehension, verbal and visuo-spatial working memory, and spatial ability, were also considered.

Sixty-five eighth graders were involved in a pretest, immediate posttest, and delayed posttest design. They were randomly assigned to a different reading condition. Findings revealed that, overall, an illustrated text was more effective in enhancing readers' learning performance compared to a non-illustrated text. Furthermore, readers of the text with the detailed picture outperformed readers of the text with the schematic picture at the immediate but not delayed posttest. Eye-movement analyses revealed that readers of the text with a schematic picture went further a simple rereading of some parts of the materials, attempting more to integrate verbal and pictorial information. The differential roles played by a schematic vs. a detailed picture in the cognitive processing of an illustrated scientific text are discussed.

Theoretical Framework and Aims

Research investigating learning from verbal and visual material is particularly important since textbooks, especially in domains like science, contain various kinds of instructional pictures. They are supposed to enhance learning (Mayer, 1989; Mayer & Gallini, 1990) but research has indicated that it is not always true that “a picture is worth a thousand words” (Mayer & Sims, 1994). Research has also posited that successful learning from illustrated text requires the information provided by the pictures to be integrated with information provided by the text, which can make high cognitive demands on learners (Ainsworth, 2006; Bartholome & Bromme, 2009; Florax & Ploetzner, 2010; Schnotz & Bannert, 2003). In agreement with Mayer (2001), Schnotz (2002) has used separate processing systems for verbal and pictorial information. However, he focused on the essential differences between the two sign systems and conceived the process of integration of verbal and pictorial information as a structure-mapping process (Gentner, 1989). The corresponding elements of the two different representations, and their relationship, are mentally mapped (Schnotz, 2002).

Based on these research issues, this study compared two kinds of potentially useful pictures, detailed vs. schematic, which illustrate the same text in order to examine the integration process of verbal and pictorial information. A detailed picture is an illustration that depicts the theme of a text in a rich representational, but not decorative, way since its function is to convey information. Therefore, it does not include seductive details (Harp & Mayer, 1998). A schematic picture is a simplified illustration of the text content, which does not resemble the thing it represents, but is also not so abstract as to require interpretation. The process of information integration was traced through fine-grained eye-movement analysis (Hyona, 2010; Hyona, Lorch, & Rinck, 2003; Inhoff & Radach, 1998). Most research on learning from text and pictures has investigated outcomes. Fewer studies, however, have focused on the cognitive processes, and almost all have used thinking-aloud methodology (e.g. Butcher, 2006; Cromley, Synder-Hoga, & Luciw-Dubas, 2010). Even the few recent multimedia studies that have measured eye fixations have not used fine-grained