ARTICLE IN PRESS

Learning and Instruction xxx (2017) 1–16

Contents lists available at ScienceDirect

Learning and Instruction

journal homepage: www.elsevier.com/locate/learninstruc

Do drawing tasks improve monitoring and control during learning from text?

Katrin Schleinschok [a, b, *], Alexander Eitel [c], Katharina Scheiter [a, b]

[a] Leibniz-Institut für Wissensmedien, Tübingen, Germany
[b] University of Tübingen, Germany
[c] University of Freiburg, Germany

A R T I C L E I N F O

Article history:
Received 18 April 2016
Received in revised form
26 January 2017
Accepted 10 February 2017
Available online xxx

Keywords:
Self-regulated learning
Metacognition
Monitoring
Cognitive load
Drawing
Learning from text

A B S T R A C T

In two experiments it was investigated how drawing as a monitoring task affects self-regulated learning and cognitive load. To this end, participants (Exp. 1: $N = 73$, Exp. 2: $N = 69$) were randomly assigned to one of two conditions. In the experimental condition, students were asked to read an expository text on the formation of polar lights consisting of five paragraphs, whereby, after each paragraph, they had to create a drawing of the text's content. In the control condition, students read the same text, but performed no drawing task. In both conditions, students had to give judgments of learning (JoLs) after each paragraph and after reading the whole text as well as rate their cognitive load. Then, they were asked to select paragraphs for restudy. In Experiment 1, participants continued with an assessment of their learning outcomes immediately after their restudy selection, whereas in Experiment 2 they were first given the opportunity to actually restudy the selected paragraphs before working on the posttest. Results of both experiments indicate that JoLs rather than cognitive load predicted posttest performance. Moreover, students in the drawing condition compared with the control condition exhibited more accurate (relative) monitoring in Experiment 1 in that their JoLs were more strongly related to performance. Moreover, JoLs predicted students' restudy decisions in both experiments; however, this effect was by-and-large independent of whether they had to draw. Overall, results hint towards the potential of drawing to support metacognitive monitoring.

© 2017 Elsevier Ltd. All rights reserved.

1. Introduction

With the increasing availability of autonomous learning opportunities, the ability to self-regulate one's learning becomes more important. That is, students need to be able to monitor and control their learning (self-regulated learning [SRL], Bjork, Dunlosky, & Kornell, 2013). However, monitoring has been found to be inaccurate when learning from expository text (e.g., Eitel, 2016; Jaeger & Wiley, 2014) in that learners overestimate their level of understanding. Inaccurate monitoring can lead to inadequate control in that, for instance, learners stop studying materials too early or decide against restudying materials even though the materials have not yet been properly understood. As a consequence, students may show bad learning outcomes.

The present research investigated whether monitoring accuracy can be improved when learning from expository text is followed by a generative drawing task and whether improvements in monitoring accuracy also lead to more effective regulation. On the one hand, previous research has shown that generative learning tasks such as writing keywords, summaries, or completing diagrams and concept maps after learning text may improve monitoring accuracy and control (e.g., van Loon, de Bruin, van Gog, van Merriënboer, & Dunlosky, 2014; Redford, Thiede, Wiley, & Griffin, 2012; Thiede, Anderson, & Therriault, 2003; Thiede & Anderson, 2003). Hence, similar effects may be expected when asking students to draw (SRL perspective; e.g., Bjork et al., 2013). On the other hand, drawing may also hinder self-regulated learning because it imposes additional demands on the cognitive system, thereby increasing the risk of an overload (cognitive load perspective; e.g., Sweller, van Merriënboer, & Paas, 1998). Accordingly, in the present research we contrasted hypotheses regarding the effects of drawing that were derived from either a SRL or a cognitive load perspective.

* Corresponding author. Leibniz-Institut für Wissensmedien, Schleichstraße 6, 72076 Tübingen, Germany.
E-mail address: k.schleinschok@iwm-tuebingen.de (K. Schleinschok).

http://dx.doi.org/10.1016/j.learninstruc.2017.02.002
0959-4752/© 2017 Elsevier Ltd. All rights reserved.

Please cite this article in press as: Schleinschok, K., et al., Do drawing tasks improve monitoring and control during learning from text?, *Learning and Instruction* (2017), http://dx.doi.org/10.1016/j.learninstruc.2017.02.002

1.1. Self-regulated learning

One crucial element of self-regulated learning is monitoring, that is, the ability to assess one's state of learning relative to one's leaning objectives (Bjork et al., 2013). By monitoring their learning, learners consider what they have understood and whether they will be able to recall the information in a later test to a level that matches their learning goal. Monitoring can be measured by asking learners to provide judgments of their future performance (*Judgments of learning*; JoLs). Learners who are good at self-regulating their learning are expected to make accurate monitoring judgments. Whether monitoring is accurate can be determined in at least two ways referred to as absolute or relative monitoring accuracy, respectively (cf. Schraw, 2009). *Absolute monitoring accuracy* denotes the degree to which the absolute JoLs value matches the performance in a later test (calibration; Alexander, 2013). *Relative monitoring accuracy* refers to the relative correspondence between a JoL value and performance across items (resolution; e.g., Lichtenstein & Fishhoff, 1977; Nelson & Narens, 1990). Students with good relative monitoring accuracy report higher JoLs for those items for which they also show better performance (compared to other items from a list). Absolute monitoring accuracy says something about how well students can judge their performance at an overall level or whether they over- or underestimate themselves. Relative monitoring accuracy, on the other hand, allows making statements about whether learners can discriminate between units learned well and those learned less well. Importantly, the two measures of monitoring accuracy do not need to be aligned within a person. That is, a person may continuously overestimate his or her performance, while at the same time being well able to discriminate between learning units.

A high monitoring accuracy is important for successful learning, because it is assumed to provide the basis for goal-directed learning behavior (Thiede & Dunlosky, 1999). That is, students who are well able to judge their own level of goal achievement are also expected to more adequately control and regulate their future learning process, for instance, when deciding which contents to restudy or for how long. The question of whether accurate monitoring leads to more adequate control is researched by either analyzing students' restudy selections or the time they take for restudy (relative to their JoLs). Whereas selection for restudy is assumed to reflect a more deliberate decision, restudy time also entails bottom-up or data-driven influences such as text difficulty (e.g. Koriat, Nussinson, & Ackerman, 2014; Thiede & Dunlosky, 1999). If JoLs are predictive for students' restudy decisions, then control is assumed to be adapted to the students' monitoring ('monitoring-based control'; Pieger, Mengelkamp, & Bannert, 2016).

Unfortunately, learners' monitoring for complex learning has been shown to be inaccurate (e.g., Eitel, 2016; Jaeger & Wiley, 2014; Serra & Dunlosky, 2010). While making their judgments, learners are influenced by their own experiences, beliefs, misconceptions, heuristics, and biases regarding learning (e.g., Rawson & Dunlosky, 2002; Shanks & Serra, 2014; Zhao & Linderholm, 2008). For example, learners use their familiarity with the topic rather than their understanding to make metacomprehension judgments (Glenberg, Sanocki, Epstein, & Morris, 1987). Moreover, learners are influenced by how easy the text was to learn (Miele, Finn, & Molden, 2011), and by how fast an answer to a question came to their mind (Benjamin, Bjork, & Schwartz, 1998). This can lead to inaccurate monitoring on both a relative and an absolute level (Koriat, Lichtenstein, & Fischhoff, 1980).

Critically, inaccurate monitoring can instigate ineffective control. Overconfidence can cause a learner to invest too little effort in the task (e.g., Paik & Schraw, 2013) and/or to terminate learning too early, thereby leading to worse performance (Dunlosky & Rawson, 2012). Underconfidence can lead to continued studying although the learner already knows the contents well enough, therefore yielding inefficient learning (e.g., Bjork et al., 2013). To alleviate problems of inaccurate monitoring and control, previous research identified the following methods: (a) learners actively generate response to a question during the learning process rather than only passively reading a text (Mazzoni & Nelson, 1995), (b) monitoring occurs after a test of the material (King, Zechmeister, & Shaughnessy, 1980), (c) learners monitor their learning after and not during the learning process (Dunlosky & Nelson, 1992; Nelson & Dunlosky, 1991). One approach that combines these factors is to let learners perform an active generation task after learning, which was also implemented in the present research. To accomplish such a task, learners have to recall the information they just learned and regenerate the learning content by themselves. This task serves as a kind of test and gives valuable information about one's actual state of learning in regard to one's learning goal.

In line with this reasoning, studies suggest that working on a generative task improves monitoring accuracy compared with no task (e.g., van Loon et al., 2014; Redford et al., 2012; Thiede et al., 2003; Thiede & Anderson, 2003). Moreover, results suggest that the timing of the generative tasks is important. On the one hand, there are several studies showing that generating keywords and summarizing were effective monitoring tasks only when administered with a delay (e.g., Anderson & Thiede, 2008; Thiede & Anderson, 2003; Thiede et al., 2003). On the other hand, there is also evidence that generative tasks such as diagram completion or concept mapping were effective when administered immediately after learning (van Loon et al., 2014; Redford et al., 2012). Redford et al. (2012) argue that to perform well on a generative task such as concept mapping, learners need to understand text not just at the surface level (i.e., the exact words) or text-base level (i.e., the meaning of sentences) but at the situation-model level (cf. Kintsch, 1998); that is, learners need to integrate ideas from the text with the help of their prior knowledge to build a causal model of the text meaning, based on which they can construct their concept map. Because concept mapping requires understanding at the situation-model level, and not just remembering of single details, it is less affected by the number of details that are still present in working memory when executing the task immediately. When the learning outcome tests likewise require understanding at the situation-model level, as is often the case, performing a generative task such as concept mapping can improve monitoring accuracy because the processes required by the monitoring task match the processes required by the test (i.e., transfer-appropriate monitoring; Dunlosky, Rawson, & Middleton, 2005). Since free-hand drawing as a monitoring task requires similar cognitive processing as concept mapping, it might also foster monitoring when executed either immediately or after a delay. Nevertheless, the processes between monitoring task and posttest are even better matched when not just the posttest but also the monitoring task is presented after a delay; and hence, delaying the generative task should foster monitoring more strongly (cf. Redford et al., 2012).

Relatively few empirical studies have investigated the link between monitoring and control so far (for exceptions see Pieger et al., 2016; Thiede et al., 2003). For instance, Thiede et al. (2003) showed that learners in the condition with the highest monitoring accuracy were also more likely to select less learned texts over better learned texts for restudy. In their study, they had two learning phases, which were each followed by a test. The performance on the first test did not differ significantly among conditions. After a second learning phase, in which the participants could regulate their learning, the test performance of the participants in the condition with a delayed monitoring task (generation of keywords) were better than the performance in the other conditions.

Download English Version:

https://daneshyari.com/en/article/4940219

Download Persian Version:

https://daneshyari.com/article/4940219

Daneshyari.com