



Seductive details and attention distraction – An eye tracker experiment



Günter Daniel Rey*

Department of E-Learning and New Media, Institute for Media Research, Faculty of Humanities, Technische Universität Chemnitz, Straße der Nationen 12, 09111 Chemnitz, Germany

ARTICLE INFO

Article history:

Available online 28 December 2013

Keywords:

Multimedia learning
Cognitive theory of multimedia learning
Seductive details
Attention control
Attention distraction

ABSTRACT

The seductive detail principle asserts that people learn more deeply from a multimedia presentation when interesting but unimportant adjuncts are excluded. The recent eye tracker experiment attempts to expand this principle for learning contexts containing no time limits and examines the moderating effect of attention control. Students ($N = 55$) received an illustrated introduction to factor analysis and then took a retention and transfer test. Each learner was randomly assigned to one cell of a 2 (with or without seductive text passages) \times 2 (with or without seductive illustrations) between subjects factorial design. Students who did not receive seductive text passages or seductive illustrations performed better on transfer, but not on retention than did learners receiving these details. The lower the learner attention control (measured with an anti-saccadic test), the more harmful were seductive text passages on transfer. Eye movements indicate that seductive text passages and illustrations might impede transfer differently.

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1. Introduction

How can a multimedia instructional message be designed to optimize instructional effectiveness? A multimedia instructional message is a communication containing text and pictures intended to foster learning (Mayer, 2005a). For example, consider an illustrated introductory text about factor analysis, a special area of research methods. One conceivable technique for improving instructional effectiveness is to add or remove seductive details (cf. Harp & Mayer, 1997).

Seductive details are interesting but unimportant or even irrelevant details that are not necessary to achieve the instructional objective (Mayer, 2005c). In the first studies concerning seductive details, these details refer to written seductive text passages typically added to an instructional text (e.g., Garner, Gillingham, & White, 1989). Latter studies also have included seductive illustrations added to a multimedia message (e.g., Harp & Mayer, 1998). For example, interesting and entertaining text passages about the biography of an important methodologist as well as pictures showing the portrait of a researcher can be added or removed. These text passages and illustrations are only tangentially related to the topic and are unimportant or irrelevant adjuncts not necessary to achieving the instructional objective (i.e., understanding the procedure of the factor analysis). On one hand, many teachers, textbook writers and instructional multimedia designers add these details in an instructional message hoping to compel a learner to pay more attention to the entire instructional material and to foster learning outcome by heightening his or her curiosity, enjoyment, and inter-

est in the topic (cf. Harp & Mayer, 1997). On the other hand, it could be assumed that removing seductive details improves learning outcome, for example, by shifting learners' attention from irrelevant to relevant details (Harp & Mayer, 1997). In this regard, the seductive detail effect arises when people learn more deeply from an instructional message when extraneous material is excluded rather than included (Mayer, 2005c).

The purpose of the present experiment is to investigate, if and under which specific conditions, seductive details in a multimedia instructional message affect learning outcome. In addition, the present experiment examines the causes leading to the seductive detail effect. In the following section, the theoretical explanations and empirical findings concerning the seductive detail effect and its attention distraction explanation are presented. Three predictions are tested in this experiment, and then followed by a discussion about theoretical and practical implications, limitations, and future research directions.

1.1. The seductive detail effect and its theoretical explanations

The seductive detail effect, postulated in the context of the cognitive theory of multimedia learning (CTML, see Mayer, 2005a), assumes that students learn more deeply from a multimedia message when extraneous material is excluded rather than included. The CTML (Mayer, 2005a) is based on the assumptions that the human information-processing system contains a visual/pictorial channel and an auditory/verbal channel (dual-channels assumption), that each channel has limited capacity for processing (limited capacity assumption), and that active learning entails carrying out a coordinated set of cognitive processes during learning (active processing assumption). Furthermore, three different memory stores

* Tel.: +49 371 33746

E-mail address: Gunter-Daniel.Rey@Phil.TU-Chemnitz.de

are assumed, which include sensory memory, working memory, and long-term memory. Words and images are processed mainly in the working memory. The major cognitive processes required for learning with words and images are selecting, organizing, and integrating. Design principles derived from the CTML were verified in numerous experiments with different kinds of learning contents. However, it can be criticized (e.g., Rey, 2010) that the CTML does not consider recent working memory models (e.g., Baddeley, 2000) and neglect motivational and affective aspects relevant for multimedia learning to a great extent. In addition, the design principles (primarily tested in the field of natural science) derived from the CTML cannot be generalized to other contents like social sciences (De Westelinck, Valcke, De Craene, & Kirschner, 2005).

According to the distraction hypothesis, postulated by Harp and Mayer (1998), seductive details reduce learning outcome by drawing the learner's selective attention away from important information. In this regard, Harp and Mayer (1998) assume that seductive details tend to contain information that requires little attentional effort and are easily understood. Garner (1992) and Garner, Brown, Sanders, and Menke (1992) use a light switch metaphor to explain information processing (Anderson, Mason, & Shirey, 1984) where the switch can be turned on (often to seductive details) and off (often to important generalizations). A similar explanation for the distraction hypothesis presumes that seductive details harm learning outcomes only for learner's with low working memory capacity who are less able to control their attention and focus on relevant information (Sanchez & Wiley, 2006). There are other theoretical explanations for the effects of seductive details (e.g., Harp & Mayer, 1998; Lehman, Schraw, McCrudden, & Hartley, 2007). They mainly concern working memory overload, schema interference, and coherence disruption (Rey, 2012).

1.2. Empirical findings regarding the seductive detail effect

A meta-analysis conducted by Rey (2012) reveals a significant seductive detail effect with small to medium effect sizes ($d = 0.30$) for retention performance (including 34 effects) and medium effect sizes ($d = 0.48$) for transfer performance (including 21 effects). Different kinds of seductive details (e.g., seductive text passages or seductive illustrations) might be an important moderating factor for the theoretical explanations of the seductive detail effect as well as for the practical implications for instructional designers. First, different kinds of seductive details might be unevenly difficult to ignore, making them relevant for the attention distraction explanation. Second, a moderating effect of different kinds of seductive details would be valuable information for an instructional designer, because of the importance of knowing which kinds of seductive details should be especially avoided. For seductive text passages, the meta-analysis revealed the significant mean weighted effect sizes of $d = 0.27$ for retention performance and $d = 0.65$ for transfer performance. For seductive illustrations, the mean weighted effect size was $d = 0.95$ for retention performance and $d = 0.83$ for transfer performance. Overall, the results indicated that the kind of seductive details used might influence the strength of the seductive detail effect. However, other variables like the presence of a time limit might have caused these results (Rey, 2012).

Using a time limit in the learning phase might lead to lower learning performance for learners in the seductive detail condition. These learners might have problems processing the larger amount of instructional material in time or at least have to hurry in order to finish. Note that many studies typically contain 30–40% additional information compared to groups not receiving seductive details (Towler, 2009). A tight time limit in the test phase could also be decreasing the learning outcome of students receiving seductive details, especially if they were advised to recall and write down

everything (i.e., the important information and the seductive details) they can remember (Rey, 2012). In addition, a moderating effect of the presence of a time limit would have been valuable information for an instructional designer, because of being able to better adapt instructional materials to specific learning situations and conditions (e.g. time restrictions).

The meta-analysis revealed that the presence of a time limit was a significant moderating factor for the seductive detail effect (Rey, 2012). Studies containing a time limit in the learning and test phases showed a significant seductive detail effect with medium to large effect sizes ($d = 0.66$ each) both for retention and transfer performance. In contrast, studies including no time limit either in the learning or in the test phases indicated no consistent significant seductive detail effect. The effect size for retention performance was very small ($d = 0.10$) and significant on a 5% level, but not on a 1% level. The effect size for transfer performance was very small ($d = 0.06$) and not significant, possibly due to the small number of studies (5 experiments). Overall, the results indicate that the seductive detail effect is as yet only confirmed for learning contexts containing a time limit in the learning and test phases.

1.3. Empirical findings for the attention distraction explanation concerning the seductive detail effect

One of the first experiments to test the attention distraction explanation for the effects of seductive details was conducted by Harp and Mayer (1998). The two experiments contained seductive illustrations and seductive text passages and used a time limit in the learning phase as well as in the test phase. The selection process toward structurally important ideas was guided by highlighting important information through a bold, italicized font (Experiment 1) and by adding learning objectives preceding the instructional material (Experiment 2). Both techniques did not significantly reduce the seductive detail effect found for recall and transfer performance, putting the attention distraction explanation into question. However, highlighting important information had no significant effect either on recall or on transfer performance suggesting it was insufficient to reduce the seductive detail effect, whereas adding learning objectives had significant effects ($d = 0.35$ for recall and $d = 0.60$ for transfer).

In contrast to Harp and Mayer (1998), other authors found empirical evidence supporting the attention distraction explanation. The results from Lehman et al. (2007, Exp. 2) confirmed that important information in an instructional message received less attention if seductive details were added. The authors did not use a time limit either in the learning phase or in the test phase. Participants who received seductive text passages spent less time ($d = 0.56$) with the base text than participants who received the base text without seductive text passages. Additionally, readers who received seductive text passages achieved lower retention scores ($d = 0.55$) for the important main ideas than readers who did not receive seductive text passages.

Peshkam, Mensink, Putnam, and Rapp (2011) used three different types of pre-reading instructions in two experiments concerning space travel and causes of lightning. Time limits were not used. The instructions advised the learners to focus on specific concepts described as relevant, to ignore specific concepts described as irrelevant, or to simply be aware that the text might generally contain irrelevant elements. Results revealed no significant main effect for either pre-reading instructions on reading times or for recall performance concerning the base sentences compared to the condition without these instructions. Only for the seductive detail sentences did the instruction to simply be aware that the text might generally contain irrelevant elements significantly reduce recall performance in the first experiment ($d = 0.58$) and reading

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