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Exploring the effects of seductive details with the 4-phase model of interest

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ABSTRACT

Although numerous studies have investigated the seductive details effect in multimedia learning and remarked that seductive details can arouse motivation and interest, few studies have examined the seductive details effect using a motivational framework. In order to fill the gap, the present study used a multiple regression model to examine the predictive relationship between four types of interest and post-task performance of participants who received either a passage containing seductive details or a base-only passage. Participants in both groups ($N = 258$) were asked to learn a passage about geology. An interest questionnaire was validated by using an exploratory factor analysis (EFA). The results of variance analyses showed that the seductive details group rated the learning material significantly higher in triggered situational interest than did the base passage group. Furthermore, the results showed that triggered situational interest mediated the effects of seductive details on recall while there was no mediation effect via maintained situational interest. In addition, emerging and well-developed individual interest moderated the effects of seductive details. In sum, the results indicated that different types of interest play different roles in learning when seductive details are involved. Theoretical and practical implications of the results are discussed and future directions are suggested.

1. Theoretical underpinnings

1.1. Cognitive load theory and seductive details

Cognitive load theory (CLT) was developed using the human cognitive architecture and the limitations of working memory. There are three types of cognitive load: intrinsic, extraneous, and germane cognitive load (Leppink, Paas, van Gog, van der Vleuten, & Merrienboer, 2014; Sweller, 1999). Intrinsic and extraneous cognitive load emphasize the characteristics of the material, whereas germane cognitive load is concerned only with learner characteristics. Intrinsic cognitive load refers to cognitive processing essential for comprehending learning materials and is determined by the intrinsic or inherent complexity of information to be learned (DeLeeuw & Mayer, 2008; Van Merrienboer & Sweller, 2005). Extraneous cognitive load is defined as unnecessary information processing concerned with the manner in which instruction is designed (Cierniak, Scheiter, & Gerjets, 2009; Sweller, 2010), while germane cognitive load is related to learners' aptitudes and reflects the effort learners exert to construct schemas (Lee, 2013; Madrid & Canas, 2009).

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The original model of CLT has been questioned and challenged by researchers. For example, Sweller (2010) argued that unlike intrinsic and extraneous cognitive load, germane cognitive load does not significantly constitute an independent source of working memory load and further concluded that germane cognitive load is dependent on intrinsic cognitive load and served to devote working memory resources to element interactivity associated with intrinsic cognitive load. Choi, van Merrienboer, and Paas (2014) considered intrinsic load, extraneous load, and germane resources in their revised model of CLT and illustrated that germane resources refer to working memory resources allocated to deal with intrinsic cognitive load.

The total cognitive load associated with a learning task is the addition of all three types of cognitive load. Considering that working memory (WM) is very limited in both capacity and duration, the total cognitive load should not exceed the available WM processing capacity for learning to be effective (Kirschner, Kester, & Corbalan, 2011). It is well documented that "it becomes imperative for teachers and instructional designers to decrease the extraneous cognitive load by using effective instructional interventions" (Sweller, van Merrienboer, & Paas, 1998, p. 259). Indeed, reducing extraneous cognitive load should be a major consideration when designing effective learning materials. Seductive details are defined as entertaining but irrelevant materials added to the main learning content intended to arouse learners' interest. On the other hand, such details are believed to constitute a source of extraneous cognitive load because they do not contribute to learning and can be altered by instructional interventions (Beckmann, 2010; Park, Moreno, Seufert, & Brunken, 2011; Sweller et al., 1998).

1.2. Overloading working memory explanation of the seductive details effect

The seductive details effect refers to an empirical effect in which seductive details reduce the recall and/or comprehension of learning information (Sanchez & Wiley, 2006). Since the emergence of the coherence principle that advocates avoiding introducing seductive details in learning – one of the concepts raised by Mayer in his cognitive theory of multimedia learning (Mayer & Fiorella, 2014)- there have been at least four theories that attempt to explain the principle: attention distraction, coherence disruption, diversion (also known as schema interference), and overloading working memory (Harp & Mayer, 1998; Rey, 2012). The distraction hypothesis states that seductive details hurt learning performance by drawing learners' selective attention away from the important information; the disruption hypothesis suggests that seductive details harm learning performance by interrupting the transition from processing one main idea to the next; the diversion hypothesis assumes that seductive details do their damage by priming inappropriate schemas around which learners organize the information; and the overloading working memory hypothesis assumes that seductive details impose an extraneous cognitive load on the learner's limited working memory, leaving less capacity for making sense of the essential information.

Among the theories, the working memory hypothesis may be considered the most agreed-upon explanation (see Rey, 2012). The theoretical premise is that seductive details, considered as irrelevant interesting information or tangential to the main idea (Broughton, Sinatra, & Reynolds, 2010; Towler et al., 2008), may inevitably impose an extraneous cognitive load on learners' working memory, thus undermining their learning process and reducing their performance. Mayer, Bove, Bryman, Mars, and Tapangco (1996) found that learners in an illustrations-only group outperformed those receiving illustrations plus seductive details on both recall and problem-solving performance. Mayer et al. proposed that the verbal working memory of the seductive-detail group was overloaded due to the additional words. In another study, Mayer, Griffith, Jurkowitz, and Rothman (2008) attributed the reduced transfer performance of those reading high-interest seductive details to the explanation that the details draw more of the learner's cognitive processing capacity. With the exception of Sanchez and Wiley's (2006) study, there is a paucity of research explicitly relating working memory capacity to the seductive details effect. In the study, they introduced the working memory and controlled attention theory (WMC) to examine the seductive detail effect and suggested that high-WMC individuals were not as susceptible to the seductive details effect as low-WMC individuals. Also, Park et al. (2011) found that seductive details had a detrimental effect on learning under conditions of high cognitive load.

However, working memory capacity is one of the cognitive abilities that are less amenable to change. As Apter (2012) suggested, "working memory was originally conceptualized as a limited capacity system and each component was specified partly by its fixed capacity" (p 259). Harrison et al. (2013) demonstrated that training on working memory improved only a limited number of aspects (reading-span and rotation-span tasks) of working memory capacity. Flynn and Storandt (1990) concluded that there were no apparent benefits to be gained from training on working memory for adults. Taken together, these findings indicate that even though working memory can moderate the negative effect of seductive details, learning may be inhibited because learners are unable to manipulate their working memory when presented with seductive details. In contrast, affective engagement (e.g., interest, enjoyment, happiness, boredom, and anxiety) is malleable to improvement via pedagogy and other interventions (Lawson & Lawson, 2013).

1.3. An integrative perspective

Researchers have delineated the need to incorporate affective and motivational factors into cognitive theories of multimedia learning (D'Mello, Lehman, Pekrun, & Graesser, 2014; Leutner, 2014). In order to extend the cognitive theory of multimedia learning (Mayer, 2001), Moreno (2005) proposed the Cognitive-Affective Theory of Learning, with media as a useful framework for understanding the role of cognition and affect in jointly explaining learning with media. In response to that, affective aspects have been investigated in certain multimedia learning fields such as signaling and segmentation