

Seductive Details in Video Lectures: Examining the Effects of Placement on Learner Engagement

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Abstract: The seductive details effect occurs when interesting but irrelevant information diverts learners' attention, potentially impairing comprehension and retention. While text-based research shows early placement hinders performance more than later placement, its effect on engagement in video lectures remains unclear. This experimental study examined how the presence and placement of seductive details relate to learner performance and engagement across four video conditions: seductive-only, none, and two mixed versions with details in the first or second half. Results showed no significant differences in test performance across conditions; however, placement was associated with differences in engagement, with mixed conditions showing reduced task-unrelated thoughts and difficulty disengaging compared to other conditions. These findings suggest incorporating seductive details early may support engagement without compromising learning outcomes, with implications for online and adaptive instructional design.

Keywords: seductive details effect, video lectures, instructional design

1. Introduction

Post-COVID-19, asynchronous online learning has become widespread in higher education, with recorded video lectures central to instruction (Impey & Formanek, 2021). Video design is thus critical for sustaining attention and engagement (Noetel et al., 2021). Though engagement predicts learning success (Deng et al., 2020), it is harder to maintain asynchronously due to limited instructor interaction (Varkey et al., 2023), placing greater responsibility on learners to self-regulate. Within this context, seductive details—interesting but instructionally irrelevant information—may shape engagement with instructional videos (Mayer, 2005), capturing attention while potentially interfering with comprehension (Harp & Mayer, 1998). Research has focused mainly on text-based materials, with mixed findings in multimedia contexts (Rey, 2012) suggesting seductive details can increase interest, reduce mind-wandering in video lectures (Bianchi & Risko, 2022), and remain memorable without harming perceived learning (Maloy et al., 2019). Their effects in fully asynchronous video learning remain understudied. The placement of seductive details is similarly understudied. In text, researchers have found that early seductive details impair learning more than later ones (Rowland et al., 2008; Wang & Adesope, 2016), but this pattern has not been tested in videos.

This study investigated how the presence and timing of seductive details affect engagement and learning in video-based instruction, with implications for scalable, adaptive technologies that personalize content based on learner engagement states (Kizilcec et al., 2013).

1.1 Learning and Engagement with Asynchronous Videos

Asynchronous video-based learning is prevalent in online, flipped, and blended instruction, offering flexible access to materials (Varkey et al., 2023). However, these environments place greater responsibility on learners to regulate their attention, often lacking direct supervision and immediate feedback, which makes sustained attention difficult. Engagement matters

especially in low-stakes settings, where grades play a smaller motivational role (Maloy et al., 2019). Additionally, motivation shapes cognitive effort and attention (Pintrich, 1999), often extending beyond academic outcomes to curiosity and professional development (Kizilcec et al., 2013). Because learners must self-regulate, design features that capture attention may support engagement, commonly conceptualized as attentional, behavioral, and affective components (Deng et al., 2020). Attentional engagement involves maintaining focus, often examined through task-unrelated thought (TUT), or attention shifting to unrelated internal thoughts (Risko et al., 2013). Affective engagement reflects emotional states like boredom and valence, linked to motivation and persistence (Pekrun et al., 2010; Bianchi & Risko, 2022), with such lapses occurring during a substantial portion of instructional time (Wong et al., 2022).

1.2 Seductive Details in Multimedia Learning, Temporal Dynamics and Placement

The Cognitive Load Theory (CLT) (Sweller, 1994) explains seductive detail effects through limited working memory capacity, with such details increasing extraneous load by diverting attention, disrupting mental representations, or activating irrelevant prior knowledge (Harp & Mayer, 1998). The Cognitive Theory of Multimedia Learning (CTML) (Mayer, 2005) similarly suggests extraneous information can overload limited visual and auditory channels. However, effects vary by modality. Static images disrupt mental models more than animations (Sundararajan & Adesope, 2020), and self-paced segmentation reduces these effects (Rey et al., 2019). Yet seductive details may also offer motivational benefits by fostering situational interest—novelty, challenge, and enjoyment—particularly among learners prone to disengagement, like those in MOOCs (Mehta et al., 2026). This benefit appears across modalities. For instance, Wang and Adesope (2016) found higher situational interest with seductive details in text-based learning, and Bianchi and Risko (2022), similarly, found greater task-unrelated thought without graphics in video lectures, suggesting irrelevant visuals may help anchor attention. Fries et al. (2019) found seductive details lowered performance in low-stakes settings but benefited lower-knowledge students in high-stakes contexts, with little effect on higher-knowledge students—revealing a tension between cognitive load and engagement, though none of the current studies examined placement.

Beyond presence, the *placement* of seductive details may also shape their effects. In text and multimedia, seductive details presented early disrupt comprehension more than those presented later, potentially by activating irrelevant schemas before core content is introduced (Harp & Mayer, 1998; Rowland et al., 2008). This work, however, has focused on static materials, leaving video lectures underexplored, particularly since instructional and extraneous elements often appear simultaneously and attention fluctuates over time (Risko et al., 2013). Given these gaps in both engagement processes and temporal placement, this study examined how the inclusion and placement of seductive details relate to attentional engagement (task-unrelated thought, difficulty disengaging) and affective engagement (valence, boredom) in self-paced video lectures.

2. Methods

2.1 Current Study and Participants

This study examined the following research questions. First, *does the presence and placement of seductive details in video lectures affect test performance* (RQ1)? Second, *how does the presence and placement of seductive details, with moderating effects of time, affect learner engagement* (RQ2)? We hypothesized that seductive details would lower test performance, with stronger effects when appearing earlier, consistent with prior text-based findings (Rey, 2012), and would increase engagement, with potentially greater effects when appearing in the second half (Risko et al., 2013). Using a between-subjects design with four conditions, two presenting only one section type throughout and two varying the placement of seductive details across the first or second section, we recruited 298 participants via Prolific (167 female, 126 male, 3 non-binary, 2 preferring not to say; M age = 38.98, SD = 12.27), compensated \$4 for completing the study remotely without researcher presence. After excluding 25 participants

(2 for using Google to answer questions, 21 for not looking at the screen, 2 for incomplete post-assessment surveys), 273 remained for analysis; with distribution: 72 in NoSed→NoSed, 65 in NoSed→Sed, 70 in Sed→NoSed, and 66 in Sed→Sed.

2.2 Materials, Measures and Procedures

Participants watched a brief (5 min 28 sec) five-slide narrated PowerPoint on the cardiac conduction system, divided into two sections (slides 1–3, 2:01; slides 4–5, 3:27), as shorter videos better engage learners (Guo et al., 2014). Seductive details were operationalized as visually and emotionally engaging but instructionally irrelevant additions (animations and humorous memes) that did not alter the lesson's conceptual or factual content (Harp & Mayer, 1998; Fries et al., 2019; Rey, 2012); Figure 1(a) shows slides and Figure 1(b) with GIFs, memes, and sound. After providing consent and being informed they would watch a video and answer questions about their thoughts, participants were intermittently probed every 50-60 seconds (twice in the first section, three times in the second) with four standard engagement probes (Weinstein, 2018), namely, task-unrelated thought (TUT) (0 = thinking about something else, 1 = thinking about the video), difficulty disengaging from current thoughts (0 = not difficult, 1 = difficult), boredom (1 = very bored to 7 = not at all bored), and valence (1 = very negative to 7 = very positive), consistent with prior experience-sampling studies of video-based learning (Wong et al., 2022). Afterward, participants completed a 12-item multiple-choice comprehension test and reported demographics, with the full study lasting about 20 minutes.

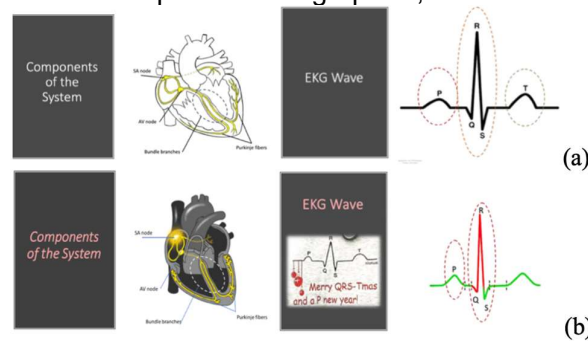


Figure 1. Instructional Presentation without (a) and with (b) Seductive Details

3. Results

RQ1 was tested with a one-way ANOVA on performance across conditions. For RQ2, engagement was examined using linear mixed-effects models (LMEs). Generalized LMEs for binary outcomes (TUT, difficulty disengaging) and simple LMEs for categorical outcomes (boredom, valence), with participants as a random effect, condition and section as fixed effects, and their interaction testing time's moderating role. Analyses used the lme4 package for R (Bates et al., 2015), with Benjamini-Hochberg (1995) corrections for multiple comparisons (8 tests per construct).

3.1 Seductive Details and Test Performance

We first examined whether the presence and placement of seductive details predicted test performance (RQ1). Mean scores (SD) were 5.69 (2.48) for NoSed→NoSed, 5.20 (2.10) for NoSed→Sed, 5.38 (2.38) for Sed→Sed, and 5.09 (2.14) for Sed→NoSed. The one-way ANOVA showed no significant differences between conditions, ($F(3, 269) = 0.911$, $p = .436$).

3.2 Seductive Details and Learner Engagement

We next examined the relationship between the presence and placement of seductive details and engagement (RQ2); Table 1 shows means and SDs for TUT, difficulty disengaging, valence, and boredom by condition. For TUT (Table 2), relative to the no-seductive-details

reference, both mixed conditions showed less TUT (NoSed→Sed: $\beta = -0.173$, $p < .001$, $\alpha = .003$; Sed→NoSed: $\beta = 0.301$, $p < .001$, $\alpha = .017$), while the seductive-details-only condition showed more TUT (Sed→Sed: $\beta = 0.353$, $p < .001$, $\alpha = .01$), suggesting learners stayed more on-task when videos combined seductive and non-seductive elements.

Table 1. Mean and Standard Deviation of Learner Engagement Measured by Condition and Section

Condition	NoSed→NoSed		NoSed→Sed		Sed→Sed		Sed→NoSed	
Section	S1	S2	S1	S2	S1	S2	S1	S2
TUT	0.277 (0.449)	0.407 (0.492)	0.257 (0.438)	0.314 (0.465)	0.333 (0.473)	0.444 (0.498)	0.330 (0.472)	0.369 (0.483)
Difficulty	0.222 (0.417)	0.259 (0.439)	0.125 (0.327)	0.205 (0.404)	0.166 (0.374)	0.161 (0.369)	0.154 (0.362)	0.225 (0.419)
Disengaging	5.034 (1.290)	4.782 (1.431)	5.378 (1.364)	5.033 (1.632)	5.151 (1.281)	4.914 (1.409)	4.984 (1.287)	4.611 (1.608)
Valence	3.746 (1.869)	4.259 (1.987)	3.271 (1.970)	3.476 (2.091)	3.530 (1.838)	3.742 (2.027)	3.376 (1.740)	3.943 (1.990)
Boredom								

A significant condition-by-section interaction also emerged (Figure 2): both mixed conditions showed smaller increases in TUT between sections (NoSed→Sed: $\beta = -0.381$, $p < .001$, $\alpha = .007$; Sed→NoSed: $\beta = -0.532$, $p < .001$, $\alpha = .02$), as did Sed→Sed ($\beta = -0.144$, $p < .001$, $\alpha = .013$).

Table 2. Effects of Condition and Section on Task-Unrelated Thoughts

Fixed and Interaction effects	Estimate	Standard Error	z-value	p-value	Adj. α
NoSed→Sed	-0.173	0.001	-243.165	<.001	0.013
Sed→Sed	0.353	0.001	495.020	<.001	0.019
Sed→NoSed	0.301	0.001	421.728	<.001	0.025
Section 2	0.756	0.001	1059.14	<.001	0.031
NoSed→Sed:Section 2	-0.381	0.001	-534.681	<.001	0.038
Sed→Sed: Section2	-0.144	0.001	-201.490	<.001	0.044
Sed→NoSed: Section 2	-0.532	0.001	-744.019	<.001	0.050

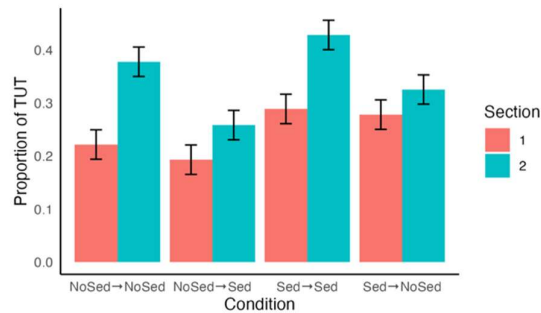


Figure 2. Interaction effects between Condition and Section on TUT.

We also examined difficulty disengaging from one's thoughts. Relative to the reference (no seductive details), only the late condition (NoSed→Sed) showed a significant effect ($\beta = -1.557$, $p = .035$), though it did not survive correction (adj. $\alpha = .013$); the seductive-only (Sed→Sed; $\beta = -0.799$, $p = .262$) and early (Sed→NoSed; $\beta = -0.800$, $p = .268$) conditions were non-significant, as was Section 2 overall ($\beta = 0.356$, $p = .317$). None of the interactions were significant: the late condition's effect in Section 2 (NoSed→Sed:Section2; $\beta = 0.782$, $p = .161$), the seductive-only condition's effect in Section 2 (Sed→Sed:Section2; $\beta = -0.389$, $p = .469$), or the early condition's effect in Section 2 (Sed→NoSed:Section2; $\beta = 0.505$, $p = .348$).

For boredom, no condition differed significantly from the reference: late (NoSed→Sed; $\beta = -0.492$, $p = .113$), seductive-only (Sed→Sed; $\beta = -0.233$, $p = .459$), early (Sed→NoSed; $\beta = -0.386$, $p = .222$). Boredom increased significantly overall from Section 1 to 2 ($\beta = 0.495$, $p < .001$). The no-details condition's effect in Section 2 (NoSed→NoSed:Section2) was significant uncorrected ($\beta = -0.290$, $p = .044$) but not after correction (adj. $\alpha = .019$); the seductive-only condition's effect in Section 2 (Sed→Sed:Section2) approached significance ($\beta = -0.283$, $p = .054$); the early condition's effect in Section 2 (Sed→NoSed:Section2) was

non-significant ($\beta = 0.071$, $p = .628$). For valence, no condition differed significantly from the reference: late (NoSed→Sed; $\beta = 0.343$, $p = .130$), seductive-only (Sed→Sed; $\beta = 0.116$, $p = .612$), early (Sed→NoSed; $\beta = -0.050$, $p = .828$). Valence declined significantly overall ($\beta = -0.252$, $p = .001$), with no significant interactions: late (NoSed→Sed:Section2; $\beta = -0.092$, $p = .405$), seductive-only (Sed→Sed:Section2; $\beta = 0.0149$, $p = .895$), early (Sed→NoSed:Section2; $\beta = -0.116$, $p = .304$).

4. Discussion and Significance

Seductive details had no significant effect on test performance, regardless of presence or placement. This aligns with prior video-based research (Bianchi & Risko, 2022) but contrasts with text-based studies (Rowland et al., 2008). A possible explanation is CTML's dual-channel assumption (Mayer, 2005), which suggests that video distributes information across visual and auditory channels, potentially reducing the resource competition that occurs when seductive and relevant information compete within a single channel in text. This may also explain why early placement did not produce a performance decrement. Importantly, performance and engagement showed different patterns. Although seductive details did not affect test scores, placement was associated with learners' attention. This is possibly important as engagement may be a distinct outcome worth optimizing in adaptive learning environments (Kizilcec et al., 2013).

Placement, however, appeared to relate to engagement over time. Mixed conditions, which alternated seductive and non-seductive segments, showed lower TUT conditions without or with only seductive details. This pattern seems consistent with situational interest theory, whereby novel features can temporarily recapture attention (Hidi & Renninger, 2006). Brief seductive elements may therefore act as attentional refreshers without substantially increasing cognitive load, whereas continuous presentation may reduce novelty and uninterrupted instructional content may become monotonous (Sweller, 1994; Tyng et al., 2017). Across conditions, TUT and boredom increased while valence decreased over the lecture, consistent with prior research on mind wandering (Risko et al., 2013). For adaptive systems, this suggests that brief novel segments could be interspersed or introduced when engagement signals indicate rising disengagement, rather than front-loaded.

These findings can be further explored because the design cannot fully disentangle placement from time-on-task; counterbalanced designs are needed to isolate placement effects. Prior knowledge was also not assessed, despite its potential role in susceptibility to distraction (Maloy et al., 2019). Moreover, the low-stakes, compensated context differs from textbook-based studies in which seductive details impaired learning (Harp & Mayer, 1998), suggesting that the video format may partly explain the limited performance effects. Future work should also examine learner expertise, self-regulation, working-memory capacity, instructional style, and generalizability across topics.

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