

Does contiguous effect matter in PowerPoint presentations for effective instruction?

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Keywords: teaching practice, presentation delivery, contiguity, cognitive overloading

Framework

Generally, prior to instruction, instructors need to determine what kinds of materials and what types of presentation media would be most appropriate for delivering instructional content to students (Oliver & McLoughlin, 2001). Typically, when utilizing electronic media, instructors have a variety of options to choose from, such as web sites, computer software programs, instructional videos, and multimedia presentations (Bitter & Legacy, 2008).

Multimedia is “a computer-based product that enhances the communication of information by combining two or more of the following elements: text, graphic art, sound, animation, video or interactivity” (Ellis, 2001, p. 110). In addition, the effective use of multimedia software by both instructors and students has been dependent on capability of the features to present textual, visual, and auditory information (Alkazemi, 2003).

In regard to effective use of visuals in a multimedia presentation, a number of studies have examined the effectiveness of visuals used in various instructional tasks (Bitter & Legacy, 2008; Demirbilek, 2004; Hack, 2004). Although studies have found positive learning outcomes in use of both still and moving pictures in their experiments, other studies contrastingly found that visual aids such as graphics and pictures in electronic instructional materials may have either no effect or a negative impact on students’ learning outcomes, dependent on how electronic instructional materials are presented to students. In light of the possibility of negative impact, studies (Martin-Michiellot & Mendelsohn, 2000; Schuler, Scheiter, Rummer, & Gerjets, 2012) demonstrated that the use of animation with text was not consistently effective for students’ perception, in terms of information processing. These studies stated that a possible reason for this lack of effectiveness was related to a presentation variable identified as contiguity.

Making It Work

Contiguity in Electronic Presentation. Contiguity refers to successive, rather than simultaneous, presentation of visual and textual information. If text, animation, and other forms of visual aids are successively presented on electronic media such as PowerPoint by presenters, a presentation can be regarded as a contiguous presentation, rather than a simultaneous presentation (see Table 1). In terms of contiguity, researchers (Johnson & Mayer, 2012; Mayer & Moreno, 2002) argue that (a) whether or not animation has a positive impact may be partially dependent upon spatial contiguity effect and (b) students’ learning outcomes such as comprehension and short-term recall may be affected by not only content materials, but also the presentation itself. Consequently, it implies that among electronic learning materials, an electronic presentation integrated with animation and on-screen text may not produce a positive impact on students learning, if not contiguously presented (Johnson & Mayer, 2012; Mayer and

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Moreno, 2003). In addition, it is recommended for instructors to understand the effect of contiguity, when delivering content information in a multimedia presentation, because student learning seems to be affected by not only the content of textual and visual information, but also how it is presented (Lin, 2006; Shaw, 2003). Thus, it may be valuable for instructors to understand how contiguous usage of textual and visual information effectively works in electronic presentations such as PowerPoint.

Demirbilek (2004) states that the recall capacity of students in an electronic learning environment may be decreased, due to the occurrence of cognitive overloading generated by too much information presented simultaneously. Also, his study demonstrates that simultaneous input of both textual and visual information is more likely to result in cognitive overload rather than simultaneous input of textual information only. According to the study by Mayer and Moreno (2003), when students receive various visual information (pictures, graphics, animation, and other types of visual stimuli) at the same time, they may experience ineffective learning, because they are required to simultaneously execute different information processes. Accordingly, given with possible occurrence of cognitive overloading, inappropriate simultaneous display of information on each PowerPoint slide may be more likely to generate learning hindrance by too much information process per learning activity rather than contiguous display.

Table 1. Types of Information Display on Presentation Slides.

Simultaneous Display of Textual Info	Air Blue Sky Hot Weather		
	Slide 1		
Contiguous Display of Textual Info: Type A	Air	Air Blue Sky	Air Blue Sky Hot Weather
	Slide 1	Slide 2	Slide 3
Contiguous Display of Textual Info: Type B	Air	Air Blue Sky	Air Blue Sky Hot Weather
	Slide 1	Slide 1	Slide 1

Future Implications

Effective Display of Information in PowerPoint. As previous research has shown that cognitive overload is a major problem in electronic learning (Demirbilek, 2004; Hack, 2004), it suggests that the contiguous display of animated graphics with text might attenuate cognitive overloading (Mayer & Moreno, 2003; Paas, Renkl, & Sweller, 2003). As resulted in the previous research, instructors should incorporate more contiguous, rather than simultaneous, displays of textual and visual information they produce, in using electronic presentations such as PowerPoint.

Moreover, because the previous research has focused more on visual modality, as opposed to multiple-modalities (visual and auditory), different results could be found if the experimental materials had been designed, based upon multiple-modalities. Thus, a future study may consider multiple-modalities. Specifically, if an experiment uses both visual and auditory modalities, results may be dissimilar to the current results because student learning is also impacted by auditory information (Mayer & Moreno, 2002; 2003). In addition, the previous studies (Grace-Martin, 2001; Rummer, Schweppe, Fürstenberg, Scheiter, & Zindler, 2011) indicate that the material designed based upon multiple-modalities may create more cognitive load rather than the material designed based upon a single-modality.

Therefore, although contiguous display of information on PowerPoint slides may not always generate positive impact on student learning, contiguous display of textual and visual information on PowerPoint slides is recommended, expecting that simultaneous display generates cognitive overloading, based on the studies conducted. Since instructors and college students, nowadays, utilize more electronic learning materials in face-to-face, hybrid, and online learning environments (O'Bannon & Puckett, 2010), proper visual displays of instructional contents in presentation materials may be critical both for instructors to deliver contents effectively and for students to process contents cognitively successful.

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