2.3 Multimedia Learning Principles for Managing the Processing of Information, and Important Social Cues

Findings:
Managing the Processing of Information

✓ **Segmenting Principle:** This is one of the two methods for reducing cognitive loads, and it indicates that “animations presented in segments are more effective than animations presented as a continuous stream of information, and segmentation has been operationalized as an animation pause between segments of an animation” (Cheon, Crooks & Chung, 2014, p. 57).

- This principle also indicates to “break the lesson into manageable learned-controlled segments” (Mayer & Pilegirate, 2014, p.317). The segments help students to manage and pace the information in learning experience (Mayer & Pilegirate, 2014).

- The larger degree of segmentation led to increase in recall and application for the knowledge students acquire. Additionally, this paper found that learner’s dispositions towards an instructional material that it is segmented are usually positive, and the segmentation was perceived to help to make learning easier (Doolittle, Bryant & Chittun, 2015).

✓ **Pre-training Principle:** This principle makes reference to “providing the names and characteristics of key components before the lesson” (Mayer & Pilegirate, 2014, p. 318).

✓ **Modality Principle:** This principle refers to the learning effect that is produced from mixed-mode presentation (e.g., when the presentation is partly visual and partly auditory). This principle was developed because of the split-attention effect, and it usually occurs when an instruction is more effective while using visual and auditory elements, rather than one. Interestingly, this effect will depend on the logical relationship between both channels where one is not intelligible without the other, or when the total load (visual and auditory components) used in learning multimedia are spread in the working memory (i.e., a diagram and narration version). Additionally, the modality principle will not be present if the redundancy effect occurs (Low, & Sweller, 2014).

- Multiple authors reported the effects of the modality principle when it was presented as a dual-task methodology, and/or a set of presentations with graphics and words (tape recorded) (Mayer, 2005; Ginns, 2005; Moreno, 2006).

- On the other hand, the studies that were not able to create a modality effect experienced a reversal modality instead. This reversal modality was usually due to the complex and lengthy audio/written materials used in their treatments (Low, & Sweller, 2014; Oberfoell, & Correia, 2016).

- **Feedback Modality Effect:** This is a variation of the benefits for modality principle effect, and it refers to the feedback presented in multiples modalities is more effective than providing it only through one channel of information (visual or auditory) (O’ Neil,2000).

- **The applicability of the feedback modality effect:** The Fiorella, Vogel-Walcutt, & Schatz’s (2012) findings indicate that the modality principle can be applied also to the real-time instructional intervention, in this case, feedback. Additionally, this form of
Feedback helps students to develop and apply higher-order cognitive skills (Fiorella, Vogel-Walcutt, & Schatz, 2012).

- Feedback modality also impacts decision-making performance. Some of the findings suggest that “providing spoken-text feedback during a training resulted in a greater decision-making performance over printed-text” (Fiorella, Vogel-Walcutt, & Schatz, 2012, p. 234).

Important Social Cues

The social cues lay out in a framework which refers to the learners’ motivation is activated when the nature of the multimedia message is style or an on-screen agent’s humanlike gesturing. Figure 4 illustrates “how the presence or absences of social cues affects learning” (Mayer, 2014b).

- **Personalization Principle:** According to this principle, students learn better if the information presented is in an informal way (personalized) rather than formal. Additionally, the students used this information aimed for problem-solving tasks (Moreno & Mayer, 2004).
  - Rey & Steib (2013) confirmed Moreno and Mayer’s findings on the advantages of using informal (first and second person language) rather than a third person language.
  - The theoretical explanation for the personalization principle refers to the use of social cues that increase learner interest and motivation (Wentzel & Wigfield, 2009).

- **Voice Principle:** This principle refers to “people learn better when words of multimedia presentations are spoken in a standard accented voice rather than machine voice or foreign-accented voice” (Mayer, 2005).

Other Principles

- **Embodiment Principle:** This principle states that people learn better if the online experience includes screen agents on the display that are humanlike (Mayer, 2014b). These screen agents are similar to digital instructors that will embody humanlike animations.

Instructional Designer Recommendations:

1. The modality principle is present if the instructional material includes on-screen text when the principal information source is in auditory mode (narrative). The modality principle occurs, even more, when the on-text is in relatively small, and the main focus of the instruction is the graph or the narration. More importantly, the information presented in the auditory channel should go along with the visual information presented in the learning experience. However, if the written text is complex, long or if it does not match with the information presented in the visual channel, it can make a reversal modality principle, and it is not possible to warrant that the cognitive load-reducing technique (modality principle) (Low, & Sweller, 2014).
2. For overcoming overload problem, one approach is to allow students to control the pace of the multimedia (e.g., presentation) (Mayer & Pilegard, 2014).
3. Allowing novice learners to control the multimedia setting might not be enough for them to enhance their cognitive process and build meaningful mental models. It is suggested to provide questions
alongside the multimedia environment in order to guide their attention to important topics (Mayer & Pilegardi, 2014).

4. **Providing the characteristics of the principal components of a topic can help students to reduce cognitive load**, this strategy minimizes the amount of information that it is needed to be processed for understanding a concept. However, if students already have prior knowledge of the topic the pre-training might not be needed (Mayer & Pilegardi, 2014, p. 323).

5. “The segmenting, pre-training and modality principles are particularly relevant to the design of narrated animations, narrated videos, or narrated slideshows that contain a lot of interacting concepts presented at a fast pace” (Mayer & Pilegardi, 2014, p. 338).

6. The following are recommendations from practitioner notes from Cheon, Crooks & Chung (2014):

   - “While passive pauses may reduce extraneous cognitive load by providing learners with sufficient time to process transient information, active pauses (i.e., embedded questions) appear to promote germane cognitive load for schema construction by requiring learners to encode and retrieve information.” (Cheon, Crooks & Chung, 2014, p. 57).
   - “It would not be ideal for learners to provide a simple pause, especially for faster or complex animations. Instead, meaningful stimuli during pauses may vitalize germane cognitive load to sustain learners’ engagement in instructional animations” (Cheon, Crooks & Chung, 2014. p. 57).
Figure 3 Segmented example for Multimedia Principles

Figure 4 Social cues effects