2.4 Animation and Types of Cues

Findings:

✓ “Learners looked more often and for longer periods of time at cued than a non-cued content” (Bjorn, Rikers, Paas, 2010). Cued content refers to concepts or sentences highlighted in paragraphs that help students to pay more attention to specific content that is of the most importance.

✓ There is evidence that cued content guides learner attention to a specific region in an instructional animation. Consequently, the fixation pattern also suggests that a spotlight-cue can help learners to focus on a specific region, but only for a short period of time. Unfortunately, in this study there were no evidence that cueing can help to distribute the attention among the system presented over time. In other words, learners did not shift their attention that help them to infer relationships among systems (in the study the presentation and cues were about the cardiovascular values and other systems’ cues during the animation). This shows that spotlight-cues can only help learners to determine when to pay attention in a specific time of the animation and in a specific part of a system (as well as the cue can stimulate the cognitive process with single spotlight-cue), but not when it is to make relationship among systems (Bjorn, Rikers, Paas, 2010).

✓ Lowe (2003) mentioned three ways on a graph in animations could be changed and incorporated by a) ‘Transformations’; b) ‘translations’; c) ‘transitions.’ Providing only accurate animated depiction may not be sufficient by itself, it is necessary to bring explicit information related to the domain to help students to develop comprehensive and coherent knowledge for creating mental models. Animation is a tool that gives proper attention to learners’ abstractions of the relevant information, and the integration into prior knowledge. However, it should be coherent with the learning objective. Finally, the study analysis suggests that “it is possible a more directive learning environment incorporating specific visual and temporal guidance (such as graphics cues and pre-set interrogation pathways).” (Lowe, R. K. 2003, 175). Some of the animation consideration while implementing animations are:

- The animation can be used to show a phenomenon that is needed in a specific domain (i.e., science) (Betancourt, 2005).
- Complete control should benefit more towards advanced students compared to the beginners (Betancourt, 2005).
- The learners will benefit from animations if they are used under two conditions: a) If the concept or the phenomenon to teach involves a change over the time, and when it can be inferred that students will not understand the concept when it is in static pictures; b) when the student are novice in the domain, if the students are advanced and be able to construct mentally the phenomenon, providing animation to advance student will prevent them from forming this mental constructions of the phenomenon or system (Betancourt, 2005).
- Five design principles are provided by the author based on the research analysis: (Betancourt, M., 2005).
  - **Apprehension Principle:** The animation should add a conventional representation of the specific domain, any other representation that is an “additional cosmetic feature” should be removed. “Similarly, realism is not necessary when the point is to understand the functioning of a system or to distinguish its parts” (Betancourt, M., 2005, p. 294).
- **Congruence Principle:** “The realism of the depicted phenomenon can be distorted if it helps to understand the cause-effect relationship between in the system.” (Betrancourt, M., 2005, p. 294).

- **Interactivity Principle:** The information is better comprehended if the animation gives the control to the learner over the pace. This control can be simply given by a resume function for segmenting the animation. Lowe described (2003) that learners were not capable of estimating conceptually relevant part in the animation, but they could estimate and focus on the perceptually salient features.

- **Attention-Guiding Principle:** As Lowe mentions (2003); learners’ attention is not driven by thematically relevant changes in the animation, but rather driven by the perceptually salient features. Since novice learners do not differentiate between what is relevant and irrelevant on the changes, the attention-guiding principle suggests that designers can guide learner’s attention by using verbal comments or graphs close to the element in the animation under the focus.

- **Flexibility Principle:** The instructional material should include options where the learner can activate settings for getting or not more information. One reason for allowing students to activate or not the information is the difficulty for learners to identify what the level of knowledge that the learners are, some information might be needed, and some could also be redundant to other learners.

**Instructional Designer Recommendations:**

1. Include any animations when:
   - The concept or phenomena changes over time in a presentation. It might be more difficult for students to understand with only static pictures.
   - Giving animations to novice students in the topic is beneficial. However, giving animation to advanced students will prevent from using and creating their constructed mental models.

2. Consider the following while including animations:
   - **Apprehension Principle:** “Cosmetic” or decorative features in the animation should be removed.
   - Interactive principle: The information is better comprehended if the student has the opportunity to have control over the pace.
   - Flexibility Principle: It is difficult to identify the level of knowledge of each student, so it is essential that students have the opportunity to have or not have additional information.