VIDEO MUSTS

The checklist/summary below is taken exclusively from e-Learning and the Science of Instruction -- Proven Guidelines for the consumers and designers of multimedia learning -- Ruth Colvin Clark and Richard E. Mayer – 2nd edition (2007). Most of the notes are direct quotes/excerpts.

Multimedia and Modality Principles

Use relevant graphics explained by audio narration to communicate content.

Redundancy Principle

Do not present words as both on-screen text and narration when there are graphics on the screen.

Exceptions:

- Maintain information the learner needs time to process in text on the screen, for example, directions to tasks, new terminology.
- Printing unfamiliar technical terms on the screen may actually reduce cognitive processing because the learner does not need to grapple with decoding the spoken words. (Also okay to handle specific learning disabilities or when the verbal material is long and complex or contains unfamiliar key words.) If eyes must attend to printed words, students cannot fully attend to the animation or graphics – especially when the words and pictures are presented concurrently and at a rapid pace.

Contiguity Principle

- Avoid covering or separating information that must be integrated for learning.
- Design space for feedback to be visible close to practice answers.

Coherence Principle

- Avoid irrelevant videos, animations, music, stories, and lengthy narrations. Avoid adding any material that does not support the instructional goal. Research shows that such devices may not produce the intended effects, but instead can harm the learning process by preventing the learner from processing the essential material. Distracting. Weed them out!
- Illustrations should not be embellished to make them look more realistic than they need to be. In some cases simple black and white line drawings can be more effective than detailed color drawings or photos. During learning, students who studied text and simple illustrations made more integration inferences – indicating an attempt to understand how the heart works – than did students who studied text and complex illustrations. Animation may overload the learners' working memory because the images are so rich in details and are so transitory that they must be held in memory. Presumably, the so-called passive medium of illustrations and text actually allowed for active processing because the learners had to mentally animate the changes from one frame to the next and learners were able to control the order and pace of their processing. (Low-ability students were more easily overloaded by the extraneous material.)

Exceptions:

- Time-lapse video of seed germination or slow-motion of hummingbirds in flight are two examples of how special effects can make phenomena visible.
- Animation was more effective than static diagrams in helping students learn to make paper flowers through paper folding.

Personalization Principle

- Add just the right amount of social cues to prime a sense of social presence in the learner, without adding so much that the learner is distracted.
- The psychological advantage of conversational style, pedagogical agents, and visible authors is to induce the learner to engage with the computer as a social conversational partner. People work harder to understand material when they feel they are in a conversation with a partner, rather than simply receiving information.
- Script audio in a conversational style. Write with first and second person language, speaking with a friendly human voice, and using polite wording to establish a conversational tone in your training.
- Script virtual coaches to present instructional content such as examples and hints via audio. Use on-screen agents to provide coaching in the form of hints, worked examples, demonstrations, and explanations.
- Provide transcripts or video clips of interviews with famous scholars, so they can describe their ideas in their own words.
- Make the author visible: reveal information about themselves and highlight their personal perspectives.
- Example of personalization: *Consider the relationship between my age and the price of gasoline during the past ten years. Correlation is nearly perfect, but no one would suggest any assignment of cause.*

Segmentation Principle

Break a complex lesson into smaller parts, which are presented one at a time and can be accessed at the learner's preferred rate – students perform better than on continuous presentation.

> **Learner Control**
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> *Learning control is preferred by students, but low-prior-knowledge students learned more under program control. The kind of control to provide low-prior-knowledge students is pacing (start, stop, rewind). NOTE: results of studies show that students' preferences and judgments often may not be good indicators of the way they learn best. They don't assess their own abilities well, and they are not good guides at deciding what they need to learn and where they need to put their time. For example, there is no correlation between ratings of how much a student liked a course or instructor and actual learning. Providing students questions followed by answer/explanations – TESTING THEM with feedback – improves their ability to assess their own understanding. "Illusions of Knowing."*

Pretraining Principle

- Pretraining can help beginners to manage their processing of complex material by reducing the amount of essential processing they do at the time of the presentation.
- Teach important concepts and facts prior to procedures or processes.

Worked Example Principle

- While studying a worked example (in contrast to solving a problem), working memory is relatively free for learning. Worked examples are best for early learning and should be abandoned in favor of multiple practice assignments once the basic knowledge is acquired. Provide detailed explanations of initial worked examples for novice learners. As lesson progresses, make explanations shorter and available on demand OR in response to an error…
- **Fading**: Transition from full worked examples to full practice assignments using fading. In fading, the first example is a worked example provided completely by the instruction. The first fully worked example is followed by a second example, in which most of the steps are worked out but the learner is asked to

complete one or two of them. As examples progress, the learner gradually completes more of the steps. Eventually the learner solves a practice problem completely on his or her own.

- Better learning results from worked examples in which each step is presented on a new screen.
- Audio should be the default modality option in multimedia lessons when presenting steps related to a visual.
- Add explanations to worked-out steps.
- Base lessons on analysis of actions and thoughts of expert practitioners. Provide worked examples of experts' problem-solving actions and thoughts.

Self-Explanation Principle
- High-success learners process worked examples by explaining to themselves the principles reflected in the examples.
- Insert questions next to worked steps to promote self-explanations. Encourage learners to process examples in a meaningful way by asking them to respond to questions about worked-out steps*. (Potential problem with worked examples is that many learners either ignore them altogether or review them in a very shallow manner. Responding to questions requires learners to process the example rather than skip it or just give it cursory attention).*
- Learner explanations promoted learning only when learners explained correct answers rather than their own answers, which may have been incorrect.

Varied Context Principle
- Incorporate the environment of the job as closely as possible in worked examples designed to support learning of near-transfer tasks.
- Include at least two worked examples that vary their cover stories but embody similar principles to support learning of far-transfer tasks.
- Promote active comparisons of far-transfer worked examples by a contiguous display of the examples, plus interactions that require the learners to focus on the common principles.

Practice/Encoding Specificity Principles
- Provide job-relevant practice questions interspersed throughout the lessons. For more critical skills and knowledge, include more practice questions. Use real job tools and cases to teach job-specific problem-solving.
- Ask students to apply what was taught to new situations, rather than simply recalling lesson content.
- *Students: What are you doing now? Why are you trying that approach? What other approaches might you consider? Bringing in the metacognitive processes underlying problem solution means that students will also be able to assess the relevance of their answers, not JUST get the right answers.*
- *Reading the same text twice in a row (massed practice) improves performance on an immediate test, whereas reading the same text twice with a week in between readings (distributed practice) improves performance on a delayed test. The spacing effect, however, doesn't result in better immediate learning. It is only after a period of time that the benefits of spaced practice are realized.* As long as eight years after an original training, learners whose practice was spaced showed better retention than those who practices in a more concentrated time period.
- Phonics skills taught in reading classes scheduled in three two-minute daily sessions showed an improvement six times greater than those practicing in one six-minute daily session.

- When instructional designers are faced with uncertainty about the amount of practice to include in an instructional program, they should favor a greater amount of practice over a relatively small amount if higher student achievement is an important goal.

   Feedback Principle
- Provide explanatory feedback for correct and incorrect answers.
- Provide learners with a map of their problem-solving steps to compare with an expert map.

EXTRA
- Ample evidence that students learn better when they are interested in the material.
- Research on the expertise reversal effect suggests that instructional design techniques that are effective for beginners may not be effective for more experienced learners.
- Generative processing – is cognitive processing aimed at deeper understanding of the core material (consisting mainly of organizing and integrating) and is created by the motivation of the learner to make sense of the material.
- Active processing – learning occurs when people engage in appropriate cognitive processing during learning, such as attending to relevant material, organizing the material into a coherent structure, and integrating it with what they already know.
- From the research study results, we conclude that interactions are beneficial to far-transfer learning but that one form of interaction *(for plant-simulation game example – either selecting the plant parts OR giving an explanation for correct selections made by the program)* is probably sufficient.
- *Creating a hierarchical map of the lesson/site/concept impacts students greatly in that whatever the focus of the map, that's what they take away, so customize to your goals).*
- *DEFINITIONS: cognitive skills – facts, concepts, guidelines for a skill; metaskills – the ability to plan, monitor, and assess actions associated with problem solving; motivation – an investment of efforts to persist and solve the problem.*
- *Research reviews conclude that there is no clear evidence that Problem-Based Learning offers significant learning advantages over traditional instructional approaches. (However, it appears to improve their attitudes about the topic).*
- **Argumentation:** *POTENTIAL pro/con activity: topic assigned to group of 4. 2 compose the pro argument. 2 compose the con argument. Team reconvenes and hears arguments from each group. After one team presents their argument, the receiving pair must state back the argument adequately to demonstrate understanding of the position. The pairs reverse roles. Afterwards, the full team moves into a synthesis stage wherein the opposing perspectives are merged into a reasoned position that culminates in a group presentation or report. (Studies show that individual learners assigned to write a pro and con argument learned more than learners asked to write either a narration or a summary.) Students should be explicitly told to think of as many reasons as possible to support their positions. Research suggests that when a student develops alternatives and the discussion is moderated by another student, there is greater freedom to critique and respond to one another than when an instructor is moderating.*

Group Work
- *Maximizing group work requires structured collaborative assignments with accountability for learning of each member of the team. Reward individual output (as opposed to group output).*

- *Team-skills training includes setting objectives, problem solving, planning, decision making, and time management. Team-skills training benefits last as long as the teams that were trained together stay together.*
- *Synchronous chat leads to more accurate decisions than face-to-face discussions due to parallel communications in chat, the ability to reference the group discussion maintained in the text of the chat, as well as the anonymity of the communications.*
- *When working together, the group is capable of doing more than any single member by comparing alternative interpretations and solutions correcting each other's misconception, and forming a more holistic picture of the problem.*
- *Studies show that study done in distraction-free environments alone in a quiet room or in a team lead to better learning than distracted study (with radio, etc.)*