Science of Instruction supporting Untethered Lecture Capture

Overview:

*Untethered* *lecture capture* (ULC) is defined as the integration of multimedia resources which permit faculty to be freely mobile within the classroom while simultaneously teaching and producing audiovisual digital recordings of lecture. At the University of Portland, faculty members utilize cognitive load theory and multimedia instructional design principles to design multimedia resources that enhance learning outcomes. An interactive whiteboard application (opened on the tablet) permits faculty to synchronously record narration, handwritten annotations, illustrations, animations, and written text. Because the tablet is untethered, students may also contribute annotations, illustrations and additional educational resources during live lecture.

1. The science of multimedia instruction for ULC [*AKA evidence-based methods for presenting material in ways that help people learn* (Mayer, 2014).
   1. Cognitive load theory (Sweller, Ayers, & Kalyuga, 2011). Total amount of mental effort occurring simultaneously in working memory. Instructional design can help reduce cognitive load and enhance construction of meaningful learning.
      1. Intrinsic load: inherent difficulty of a specific topic. Instructional design can help breakdown subschema of the topic and guide learners through the process as they construct the whole.
      2. Extraneous load: this should be minimized. Extraneous load is generated by the manner of instructional design. Format of instruction should be designed to intentionally promote learning rather than generate confusion. Example: A square is a figure and should be taught using graphics rather than text.
      3. Germane load: cognition devoted to processing, constructing and automating schemata (mental models).
2. Untethered teaching utilizing multimedia resources is enhanced when the science of multimedia instruction with the theory of cognitive load are integrated Goal: manage intrinsic load, minimize extraneous load and maximize germane load:
   * 1. **Signaling principle** (Mayer & Fiorella, 2014; Mayer 2008): Cues are added to draw attention to essential material and to guide students through a process. iPad screencasting permits ability to annotate and highlight key points directly onto the tablet software (Explain everything) which is projected onto the classroom screen.
     2. **“Temporal contiguity”** (Mayer, 2008, p. 765). Multimedia software creates simultaneous presentation of audio and visual components. Learners have corresponding words with images in working memory *simultaneously*, enhancing cognitive processing and supporting congruent mental models. Temporal contiguity reduces *representational holding* which can overload cognitive processing.
     3. **Spatial contiguity** (Mayer & Fiorella, 2014).Place printed words near rather than far from corresponding illustrations/ graphics or animations. Reduces the effort required to scan back and forth between text and graphics.
     4. **Coherence** (Mayer & Fiorella, 2014; Park, Moreno, Seufert & Brunken, 2011; Sweller, Ayres & Kalyuga, 2011).Eliminate words, pictures, and sounds that are not relevant to the instructional goal. Decrease *“seductive details”* which are added to make the course interesting but do very little to promote learning. Reduces extraneous processing associated with reconciling auditory, printed words and graphics by eliminating items which are unnecessary. FOCUS! Less is more principle.
     5. **Redundancy** (Mayer & Fiorella, 2014).Students learn better from graphics and spoken narration than from graphics, spoken narration AND written text. Leave out and/or minimize written text.
     6. **ULC integrates faculty created drawings within the lecture capture screen** – eliminating the discongruence (spatial contiguity) that occurs when faculty draw on white boards/chalk boards and then erase drawings to make room for the next drawing. Drawings are saved in audiovisual format and students may revisit and restudy later, revising lecture notes as needed. Enhances self-paced learning.
        1. **On screen zoom function.** ULC permits faculty to zoom in on visual components, enhancing signaling, visibility of essential structures, and promoting temporal contiguity.
        2. **Faculty controls video availability**, reducing delays associated with media services – IT staff bypassed and access to lecture capture media available in a timely manner for students.
        3. **Classroom/venue flexibility**. Traditional lecture capture is confined to those classrooms with installed cameras and recording equipment. ULC can be used in any space that has wireless capability and internet connection ports – Sam and Ben will make specific classroom ULC accessible.
        4. **Single Solution academic technology:** ULC eliminates the need for classroom PC, wireless microphone, whiteboard, chalkboard, whiteboard markers and chalk, erasers, classroom mounted cameras, I pod recording devices.

**Literature Resources:**

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