Untethered Teaching & Lecture Capture

Promoting Inclusion and Universal Design for Learning

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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. The integration of cognitive load theory with multimedia instructional design principles promotes accessibility, universal design and facilitates student learning.

The science of multimedia instruction for ULC [AKA evidence-based methods for presenting material in ways that help people learn (Mayer, 2021]

1. ULC is an innovative model which improves upon traditional lecture capture. **(a) permits faculty-student proximity within the classroom, (b) integrates audio, powerpoint, visual annotations and signaling, (c) audiovisual real-time capture of faculty-created drawings and activities (d) facilitates opportunities to zoom screen while annotating, and (e) creates opportunity to simultaneously annotate video while teaching and showing video (Krautscheid, et al., 2019).**

2. Cognitive load theory **(Sweller, 2020). Total amount of mental effort occurring simultaneously in working memory. Appropriate instructional design enhances how people acquire, process, store and retrieve information, promoting construction of meaningful learning.**

    a. **<u>Intrinsic load</u>:** 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. Manage complexity by managing element interactivity; i.e., the number of elements an individual must process simultaneously.

b. **<u>Extraneous load</u>:** 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.
c. **<u>Germane load</u>:** cognition devoted to processing, constructing and automating schemata (mental models).

3. Integrating the Cognitive Theory of Multimedia Instruction (CTMI) within LC promotes universal design. **Goal: manage intrinsic load, minimize extraneous load and maximize germane load while simultaneously applying CTMI principles:**

a. Coherence (Krautscheid, et al., 2019; Mayer, 2021; Sweller, 2020). Cut out all the extras and eliminate redundancy – remove the fluff. Use only information that the leaner needs, simple words and visuals directly related to learning. Eliminate words, pictures, and sounds that are not relevant to the instructional goal. Moderate *"seductive details"* which are added to make the material interesting but do very little to promote learning (Park, et al., 2011). Reduces extraneous processing associated with reconciling auditory, printed words and graphics by eliminating items which are unnecessary.
b. Signaling principle (Mayer, 2021): Show the learner exactly what to pay attention to on the screen, highlight important words, use arrows to draw attention. Cues are added to draw attention to essential material and to guide students through a process. iPad screen casting permits the ability to annotate and highlight key points directly onto the whiteboard app (Explain Everything) which is projected onto the classroom screen – eliminating the need to physically point at screen or use "laser pointers". Visual signaling/annotations are recorded with audio faculty commentary and saved as the synchronized lecture capture media (Krautscheid, et al., 2019).
c. Spatial contiguity (Mayer, 2021; Sweller, 2020). Keep all related text and graphics physically close together in your frame. Reduce representational holding. 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. Reduces cognitive load by reducing split-attention and redundancy. Drawings with explanations enhances learning efficiencies (Krautscheid, et al., 2019)
d. Temporal contiguity (Mayer, 2021). Make sure the visuals and audio occur at the same time opposed to having the voiceover audio play before the visual is shown. Align instruction with the video. Multimedia software creates simultaneous presentation of audio and visual components. Learners have corresponding words with images in working memory *simultaneously (dual*

modality), reducing split attention, enhancing cognitive processing and supporting congruent mental models (Sweller, 2020). Temporal contiguity reduces *representational holding* which can overload cognitive processing. This is aligned with cognitive constructivist learning theory.

e. **ULC integrates faculty created drawings within the lecture capture screen** (Krautscheid, et al., 2019) – eliminating the split attention incongruence (*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. Promotes self-paced learning and reduces note-taking anxiety.

4. Evaluate empirical literature findings regarding academic benefits.

A. **Reduced note-taking anxiety**. Specifically, students whose first language is not English (FLNE) reported benefitting from being able to review lecture capture recording at their own pace, using closed captioning and transcripts when available. Such students reported reduced note-taking anxiety during class (Krautscheid, et al., 2019; Krautscheid et al., 2022; Nashash & Gunn, 2013).

B. **In-class focus improved** – faculty mobility helps students focus. Students report they can focus more during class and have reduced anxiety about missing something. (Krautscheid, et al., 2019; Krautscheid, et al., 2022). Time on task improved.

C. **Untethered teacher Proximity** –Traditional lecture capture may inhibit learner socialization secondary to potential decreased student-faculty interactions (Freed, et al., 2014; Groen, et al., 2016). ULC, as we have designed it, overcomes this potential barrier by promoting **proximity.** Faculty members are not confined to the front of the classroom within the scope of classroom mounted cameras. Instead, faculty members are engaged "with" the student. Students have reported untethered faculty are teaching "on our turf" – "teach from among us not at us" – promoting enhanced interaction – more personal – more connected– create a collaborative environment – enhanced student focus and attention (Krautscheid et al., 2019). FLNE students reported faculty proximity enhanced / strengthened capacity to speak up in class (Krautscheid, et al., 2022). "It is easier to ask questions because…the classroom feels much more discussion oriented" (Krautscheid, et al., 2022, p. 3.)

D. Self-paced learning
   a. Students reported engaging in "self-paced" learning outside of class and having a sense of control over their learning. They could revisit, listen and/or watch specific segments of the audio /audiovisual recorded lecture as much as was needed to rehearse and comprehend complex and difficult concepts (Groen, et al., 2016; Hall & Ivaldi, 2017; Krautscheid, et al., 2019; Morehead, et al., 2019; Murphy, et al., 2021; Nordmann, et al., 2020, Robertson & Flowers, 2020; Song, et al., 2019).
   b. **Accessibility affordances**– Closed captioning with or without transcripts, affords opportunities to go-back and go deeper (Krautscheid, et al 2022). Multiple means of engagement and representation such as synchronized audio

and visual, eliminating the complexity of trying to match up PowerPoint slides, personal notes with recorded audio (Krautscheid, et al., 2022).

E. **Lecture Capture use and academic performance:** Research is mixed showing neither a positive nor a negative effect of lecture capture usage on student academic performance (Brackenbury, 2021; Brooks, et al., 2014; Ford, et al., 2012; Groen, et al., 2016; Hadgu, et al, 2016; Yu, et al., 2015). More research is needed.

5. ULC resources – Administrative and IT perspectives

a. Hardware
   i. Classroom Computer or portable laptop
   ii. Tablet – iPad or Surface
   iii. Digital pencil – Apple Pencil or stylus
   iv. Classroom projector – projection screen
b. Software – wireless account is necessary
   i. Mirroring: AirServer Universal / AirServer Connect – Zoom is a viable option
   ii. White board app – Explain Everything or other whiteboard technology– list other options based on the configuration of your University network and institutional resources
   iii. Video platform examples: Microsoft stream, YouTube account / Kaltura– compresses LC into video that is added to course management page. YouTube provides CC and transcript. NOTE (SW): analytics is a consideration.
   iv. Course management system – LMS lecture capture videos are made available on the course management system. Easy access.
c. Human
   i. IT staff – troubleshooting and technology assistance
   ii. Faculty – recommend ULC champion and then that person trains faculty. Approximately 6 hours of training/orientation/development – then on the job.
   iii. Incubator – three , two-hour sessions collaboration between academic technology specialist, instructional design, and ULC champion educator.
d. Financial –
   i. Costs depends on process
   ii. Faculty professional development
   iii. Staff, instructional design staff: innovation costs, NOTE (GD): some of the innovation reduces workload such as captioning, downloading/uploading video files or iPod recordings and then upload to LMS.
   iv. Hardware costs
   v. Software costs
e. **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.

f. **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.
g. **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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