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Untethered Lecture Capture: Stimulating Educational Affordances Through Technology-Enhanced Teaching

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Abstract

Untethered Lecture Capture (ULC) permits faculty to be freely mobile in the classroom (untethered) and synchronously create reusable learning media assets (lecture capture) through mobile technology resources. Integrating the cognitive theory of multimedia instruction with ULC creates affordances that facilitate learning. Anecdotal student comments indicate ULC supports accessibility, enhances personalized self-paced learning, and creates opportunities for academic success. Untethered faculty teach among students, enhancing in-class focus, time-on-task, and student-faculty engagement. Although all students may benefit from ULC teaching strategies, first-generation students and students whose first language is not English reported increased confidence, coupled with decreased stress.

KEY WORDS Lecture Capture – Nursing Education – Technology – Untethered

Faculty at a small, faith-based university in the Pacific Northwest region of the United States developed and implemented the Untethered Lecture Capture (ULC) teaching methodology. ULC incorporates various technologies (iPad™, Explain Everything™ app, and AirServer Universal™) that collectively permit faculty to be freely mobile (*untethered*) in the classroom while simultaneously capturing audiovisual digital media (*lecture capture* [LC]; Krautscheid et al., 2019). Technology integration was guided by multimedia cognitive learning theory, with the intent to create educational affordances that enhance classroom teaching strategies while also facilitating learning. This article describes the development and integration of ULC in the classroom. Anecdotal student narratives describing the influence of ULC on learning are reported.

THE INNOVATION

ULC was created to enhance classroom interaction, empower student learning, overcome cost barriers of hard-wired traditional LC classrooms, and provide student access to reusable learning resources. Prior to developing ULC, teaching resources included PowerPoint slides, faculty-drawn illustrations on a wall-mounted whiteboard or chalkboard, lecture, and iPod recordings posted to the course learning management system (LMS). Students reported that they struggled to connect these various resources. Learning inefficiencies were specifically described by students with attrition risk identifiers, such as first-generation students and students whose first language was not English (FLNE; Harris et al., 2014). LC offered a solution to attenuate student concerns; however, no hard-wired LC classrooms were available at the university. As such, faculty collaborated with information technology staff to integrate learning theory, technology hardware, and software. ULC was created to overcome barriers to traditional LC.

The literature defines LC as using mounted cameras and microphones to digitally record live lecture in the classroom. Recordings are converted into media files and uploaded to the LMS. Traditional LC presents benefits and barriers to student learning. Benefits include access to archived audiovisual recordings that are subsequently used for self-paced, personalized learning, allowing students to review and rehearse desired segments after class. Reported barriers include classroom-mounted cameras and audio recording equipment that restricts faculty mobility, as well as limited visibility of whiteboard and chalkboard drawings (Freed et al., 2014; Groen et al., 2016; Marchand et al., 2014). Mobility barriers also decrease student-faculty interactions.

ULC offers a creative, technology-based, theory-guided strategy to address barriers, retain beneficial LC strengths, and support additional features afforded by technology. First, wireless screen-casting technology permits faculty to be *untethered* in the classroom. Untethered faculty teach from a mobile tablet utilizing a whiteboard application (app). Whiteboard apps, such as Explain Everything, enhance teaching strategies and learning potential through the following educational affordances: a) ability to enlarge graphics and other media during lecture; b) ability to use numerous digital ink colors to signal, annotate, and illustrate processes during lecture; c) ability to visualize instruction from anywhere in the classroom (view unimpeded by podium, equipment, or teacher); d) ability to synchronously record faculty narrations alongside animations, pictures, and text in

one multimedia LC and subsequently post to the LMS; and e) increased student-instructor interaction during the lecture. Learning theory is purposefully integrated with ULC, ensuring technology will enhance, rather than detract, from learning.

Mayer's (2008) cognitive theory of multimedia instruction (CTMI) guided ULC instructional strategies. Mayer and Fiorella (2014) suggest the following principles to reduce cognitive load and optimize learning: a) narrations should simultaneously accompany corresponding illustrations (*temporal contiguity*); b) essential text should be written next to corresponding graphics (*spatial contiguity*); and c) signaling should be used to emphasize essential information (*signaling principle*).

ULC IMPLEMENTATION AND OUTCOMES

Prior to employing ULC in the classroom, faculty met with information technology staff to install both screen-casting and whiteboard apps on university-owned devices. Wireless screen mirroring technology (AirServer Universal; approximate cost: $12 per license) was utilized to screen cast teaching resources from the tablet to the classroom projector and onto a screen. An interactive whiteboard app (Explain Everything; approximate cost: $9 per license) was installed on the mobile tablet. Existing teaching resources, such as PowerPoint slides, were modified to align with CTMI theory and principles (Mayer & Fiorella, 2014). Specifically, the *coherence principle* guided eliminating extraneous text, images, and videos from existing lecture slides, permitting space within the digital whiteboard app to augment instruction with hand-drawn illustrations and annotations during lecture. PowerPoint slides readily import into the whiteboard app as a new project, promoting a smooth transition toward ULC teaching methods.

Before class started, screen mirroring software was opened on the classroom computer, and a QR code was generated. Next, the complementary screen mirroring app was opened on the mobile tablet; the QR code was scanned, pairing the tablet and computer. Finally, the whiteboard app project was opened, and classroom teaching resources were projected onto the screen. The whiteboard app recording feature permitted faculty to simultaneously teach and record live lecture learning resources and activities. All live resources were saved in the interactive whiteboard app on the tablet. The saved ULC project was then uploaded to the faculty member's YouTube studio channel, close-captioned by YouTube studio, and imported to the university LMS where students had unlimited access to LC resources. Student orientation to ULC and digital learning resources occurred during the first week of class.

During fall semester 2019 (14 instruction weeks), the faculty member created 27 LC media assets in a three-credit pathophysiology nursing course (75-minute duration per LC). YouTube studio analytics of the 27 LC resources revealed 1,053 views (approximately 39 views per LC), suggesting ULC resources were accessible and utilized. Sixty-one students were enrolled in the course, and all students continued to attend class. The analytics do not report specific viewer identity, limiting the ability to determine which students accessed LC resources. YouTube studio analytics also revealed a 17-minute average viewing time per LC, suggesting that students engaged in self-paced learning (i.e., reviewed LC segments as needed to study, filled in notes, expanded understanding).

Anonymous, online course evaluations suggest ULC was a valued teaching strategy. Quantitative responses to Likert-scale evaluation items (1 = *low*, 5 = *high*) demonstrated a higher mean score in comparison with a prior semester when ULC was not utilized. Specifically, relevant course evaluation criteria mean values increased: a) "course was relevant, useful and valuable learning experience" increased from M = 4.80 to M = 4.98; b) "activities and teaching methods were effective" increased from M = 4.79 to M = 5.0; and c) "teaching strategies encouraged learning" increased from M = 4.84 to M = 4.98.

Qualitative course evaluation comments further suggest ULC promotes learning: a) "I truly enjoy the untethered lecture capture approach to lecturing. It allows everything to be in one place when reviewing or going back to complete my notes. It is convenient and flexible because you [faculty] can add photos, drawings, videos, and record your voice"; b) "I love that these videos [LC] go through everything from class in a way where we can see [faculty] handwritten side notes and any drawings on the slides rather than just being able to hear it. It makes it easier to go back and find something specific"; and c) "It allows for a more interactive style of teaching…the teacher is able to move around the classroom, which is helpful, it keeps us all focused. Other professors [sic.] voice record lectures, but it's so hard to find certain parts of the lecture if I just wanted to review one smaller portion of it."

A student who self-identified as FLNE stated: "Sometimes, in class, something will be said and I miss it as I am translating. ULC allows me to review things I have missed in order to recover and understand. It is also helpful to listen to parts of lecture multiple times to understand the concept, or note what is confusing. ULC helps me learn better, it integrates pictures, words, video. I do not rely on just notes." A different student stated: "I am a first-generation student, and I am super determined to be successful. ULC allows me to not only learn the material, but be confident in being able to discuss the material in the future. I love the combination of being able to see material, and being able to hear it too. I'm able to integrate the material into my own words. Confidence with the material…made the start of my nursing school journey begin smoothly and with manageable stress."

DISCUSSION AND RECOMMENDATIONS

When reviewed as a whole, ULC viewing data, combined with course evaluation data and student narratives, suggest ULC enhances effective teaching methods, promotes study efficiencies, enhances learning experiences, and increases student confidence. Specifically, student comments suggest ULC helps reduce extraneous load. As described by Sweller et al. (2011), the need to take notes while trying to pay attention and keep up with lecture creates extraneous cognitive load. The usage data and student comments are encouraging, providing inspiration to expand ULC use among faculty members.

ULC methods have the capacity to enhance access to learning resources for all students. Participants reported ULC enhances the classroom environment, supports access to self-paced learning resources, and is perceived to positively influence learning outcomes. ULC teaching strategies are also affordable, overcoming financial barriers associated with hard-wired technology in designated classrooms. Because ULC technology is mobile, faculty may use ULC strategies in any classroom with wireless access. Nurse educators should collaborate with instructional design experts and information technology staff to ensure network resources are capable of supporting untethered teaching and LC. In addition, faculty should intentionally integrate CTMI principles when implementing ULC methods, including revising teaching resources to align with CTMI best practices. Finally, research

is recommended to understand the influence ULC has on nursing students at risk for attrition.

REFERENCES

Freed, P., Bertram, J., & McLaughlin, D. (2014). Using lecture capture: A qualitative study of nursing faculty's experience. *Nurse Education Today*, *34*, 598-602.

Groen, J., Quigley, B., & Herry, Y. (2016). Examining the use of lecture capture technology: Implications for teaching and learning. *Canadian Journal for Scholarship of Teaching and Learning*, *7*(1), Article 8.

Harris, R., Rosenberg, L., & O'Rourke, M. (2014). Addressing the challenges of nursing student attrition. *Journal of Nursing Education*, *53*(1), 31-37. 10.3928/01484834-20131218-03

Krautscheid, L., Williams, S., Kahn, B., & Adams, K. (2019). Untethered lecture capture: A qualitative investigation of college student experiences. *Journal of Educational Technology Systems*, *48*(1), 97-111. 10.1177/0047239519833690

Marchand, J. P., Pearson, M., & Albon, S. (2014). Student and faculty member perspectives on lecture capture in pharmacy education. *American Journal of Pharmaceutical Education*, *78*(4), Article 74.

Mayer, R. (2008). Applying the science of learning: Evidence-based principles for the design of multimedia instruction. *American Psychologist*, *63*(8), 760-769. 10.1037/0003-066X.63.8.760

Mayer, R., & Fiorella, L. (2014). Principles for reducing extraneous processing in multimedia learning: Coherence, signaling, redundancy, spatial contiguity and temporal contiguity principles. In R. Mayer (Ed.), *Cambridge handbook of multimedia learning* (pp. 279–315). Cambridge University Press.

Sweller, J., Ayres, P., & Kalyga, S. (2011). *Cognitive load theory*. Springer.