COMMENTARY

# Ten tips to encourage student interaction with screen-capture type vodcasts

Robin K Pettit

School of Osteopathic Medicine in
Arizona, A. T. Still University, Mesa,
AZ, USA

**Abstract:** Video podcasts (vodcasts) are gaining popularity in medical education, but they can be a passive learning modality if students do not actively engage with the content. Of the two categories of vodcast software, screen-capture (mp4 output) and Flash™ (HTML5/Flash output), screen-capture has greater potential to result in passive learning because students cannot physically interact with the content. However, screen-capture offers several advantages for the producer (often faculty) and the consumer (students). As such, this type of software is popular with medical school faculty. To encourage active learning, ten tips are presented with specific strategies that faculty can use with screen-capture type vodcasts. Many of the tips also apply to Flash-type vodcasts. By incorporating these strategies, faculty with limited technical abilities can create engaging vodcasts that stimulate active learning.

**Keywords:** vodcast, video podcast, screen-capture, active learning

## Introduction

Video podcasts (vodcasts) are being used increasingly in medical education.[1–10] They offer students the advantages of convenience, ubiquity of access, the ability to self-pace, and the ability to repeat content.[3,11] In addition, they can be used to support other learning resources. For instructors, vodcasts allow standardization and potential modularization of teaching material, and are a convenient tool for flipping the class-room. In a flipped classroom, recorded lectures, readings, or vodcasts are viewed by students prior to class, and in-class time is devoted to student-centered activities.[7–9] At the organizational level, vodcasts allow dissemination to learners at different locations.

Vodcast software is either non-physically interactive screen-capture (mp4 output) or Flash™ (HTML5/Flash output). There are numerous software options within each of these broad categories, which vary in cost, ease of use, and production features.[10] With Flash-type vodcast software, for example, Adobe Captivate™ or Articulate Storyline™, the user can physically interact with the content, which is often an included practice quiz. For these physically interactive questions, the user must stop and click a button with their mouse or type a response to proceed through the vodcast. Further, the user cannot control the speed of the vodcast, and the mouse/cursor is not visible to the user.

With screen-capture vodcast software, for example Camtasia™ or Ambrosia SnapzProX™, the user cannot physically interact with the content, but they can control the speed of the vodcast and the instructor's mouse/cursor is visible. Screen-capture vodcast software is popular with medical school faculty,[10,12–14] probably because of its lower cost and fewer technical demands on the producer compared with Flash-type

Correspondence: Robin K Pettit
School of Osteopathic Medicine in
Arizona, A. T. Still University, 5850 E. Still
Circle, Mesa, AZ 85206, USA
Tel +1 480 248 8140
Fax +1 480 219 6159
Email rpettit@atsu.edu

software. Although the ability to self-pace is an advantage for users of screen-capture vodcasts, the user does not necessarily have to actively engage with the content or practice applying the content.[15]

Evidence suggests that active learning in the classroom results in improved learning outcomes.[16] Studies comparing learning outcomes between physically interactive and non-physically interactive vodcasts are lacking, but a meta-analysis of internet-based learning outcomes with health professions students indicated learning outcomes improved when interactivity, practice exercises, repetition, and feedback were used.[17] Cook et al[17] recommended incorporation of these features when designing internet-based learning, but noted that the strength of their recommendation was tempered by the limited number of reviewed studies, varied interventions and outcomes, inconsistent study findings, and relatively low methodological quality of the studies.

According to Kay,[18] two major barriers to student vodcast use are technical problems, such as excessive file size and download speed, and student preference for lectures. Reasons for preferring lectures included the perception that vodcasts were less engaging and subject to more distractions when viewed at home, the inability to ask questions, and the longer time needed to watch vodcasts compared with the time to attend a lecture. Undergraduate medical students who received a large volume of vodcasts had a preference for user-controlled speed and non-physically interactive practice questions.[10] User-controlled speed allows students to speed up presentations, pause to take notes or look things up, and rewind sections for clarification. In a computer science course,[19] students achieved significantly better learning performance and a higher level of learner satisfaction when they were able to control movement through a video, selecting important sections to review and moving backwards when desired.

Given these findings and the increased cost, technical skill, and time required to produce Flash-type vodcasts, it is worthwhile to consider methods that increase student engagement and interaction with screen-capture vodcasts. Since much has been written about engagement and multimedia learning,[11,20–23] most of the following ten tips describe methods to encourage active learning with vodcasts. The focus of the tips is on screen-capture vodcasts, but some of these methods can also be applied to Flash-type vodcasts. Many of the tips are grounded in the same principles as effective live teaching, and are based on a review of the multimedia learning literature and the author's experience creating and producing vodcasts as a medical educator.

## Tip 1: Motivate consumption (use)

Motivation, the feeling of interest or enthusiasm that makes somebody want to do something, is a powerful stimulant for getting students to actively engage and participate in a learning endeavor, and it often correlates with learning outcomes.[24,25] How can faculty motivate students to view their vodcast productions with so many other available educational resources and alternative vodcast sources, such as YouTube and Khan Academy? One potential solution is to be aware of vodcast characteristics that students value. Year 1–3 undergraduate medical students indicated that clear explanations, organization, conciseness, high yield for medical board exams, and the ability to speed up content were essential vodcast attributes.[10] Other highly valued attributes were relevance to clinical applications, inclusion of practice questions, and high-quality sound and images. In contrast, students deemed music and objects moving on the screen as not helpful. Importantly, many of the essential attributes of vodcasts valued by students facilitate multimedia learning, while the attributes considered not helpful hinder multimedia learning. Other vodcast engagement elements to consider when designing vodcast productions include short length and rapid and enthusiastic narration.[22]

Millennials were raised in an entertainment-focused, multimedia environment; as a result, they have a low tolerance for boredom.[26] If vodcasts lack variety in active learning methods, they have the potential to cause boredom, and students may not view them. Several studies have reported on medical student preferences for delivery of content in a variety of formats.[27–29] As a side benefit, providing variety may help accommodate different learning styles.

## Tip 2: Facilitate multimedia learning

For meaningful multimedia learning to take place, a substantial amount of cognitive processing has to take place in the visual and auditory channels.[30,31] Either channel can be overwhelmed by high cognitive load.[30,31] Three learning principles underlie the cognitive theory of multimedia learning: selecting – attending to the relevant incoming material; organizing – organizing the incoming material into a coherent mental representation; and integrating – relating the incoming material with existing knowledge from long-term memory.[20] In order for learners to most efficiently select and integrate verbal and visual components, multimedia presentations should not contain too much extraneous information.[27] They should be clear, organized, and concise. The addition of interesting but extraneous material to a multimedia presentation may cause the learner to use cognitive resources

on incidental processing, leaving less cognitive capacity for essential processing.[26] Music, video clips with irrelevant information, and complex backgrounds are all examples of extraneous information.[26]

Potential solutions to help learners select, organize, and integrate content in vodcasts are weeding (removal of non-essential content), inclusion of signaling features (cursor, animated arrows, stressing key content in speech), and segmentation (physical or pauses). Ibrahim et al[32] showed that students who received videos that were weeded, included signaling to direct student attention to relevant information, and incorporated breaks between segments had better knowledge transfer, structural knowledge acquisition, and lower perceived levels of learning difficulty compared with students who received videos without weeding, signaling, and segmenting.

## Tip 3: Incorporate pauses

Another solution for cognitive overload is to physically segment vodcasts or incorporate breaks (pauses) between successive segments of a presentation. Breaks help restore attention[33] and, during a pause, the learner can organize and integrate the information.[30] Pauses within a vodcast are a wonderful opportunity to capitalize on active learning strategies. The active learning might be as simple as posing questions or presenting problems and asking students to pause and consider solutions. Many of the strategies to encourage active learning described in the following tips require that the student pause the vodcast.

## Tip 4: Cue note-taking

Note-taking is positively correlated with achievement[34,35] and is beneficial because it increases attention during lectures and facilitates encoding of lecture ideas into long-term memory.[36] Provided notes enhance student learning as long as students add their own personal notes.[37,38] If vodcasts are voice-overs of PowerPoint™ slides, instructors often provide the slides as notes. The slides may be complete, "skeletons," or something in-between. To encourage note-taking, instructors can slow their narration rate, pause for students to record notes, and provide visual or verbal cues that signal students to record notes.[36]

These lecture cues prime two of the learning principles of multimedia learning, selection and organization.[35] Selection cues signal important ideas; organizational cues signal the lecture's organizational structure.[35] An example of a visual cue is the instructor's use of the PowerPoint pen or stylus when recording the vodcast in order to add important content or to summarize information. Strategically placed question marks that replace critical details in slides are another type of visual cue. For intentionally omitted content, the presenter pauses to allow students to recall the missing information, the presenter reviews the information, and students make note of it. Spoken selection lecture cues or verbal signposts[36] are statements that signify that certain material is noteworthy, for example, "this is the major virulence factor of the pathogen." Spoken organizational lecture cues are explicit statements identifying main and subordinate points of a lecture.

## Tip 5: Give auditory instruction for active learning

Because spoken lecture cues can provide a powerful means of guiding student note-taking and result in higher test achievement than just listening,[35,36] and because active learning results in improved learning outcomes,[16] providing verbal instructions for active learning in vodcasts may result in increased learning. With verbal instructions, the presenter asks the student to engage in a high-order activity such as generating a concept map, drawing and labeling a diagram, illustrating a pathway, or providing a summary.[39] For vodcasts containing technical terms that are unfamiliar to students, the presenter could ask students to pause, look up, and write out each definition. The terms could be listed at the beginning of the presentation or distributed throughout. To facilitate this activity, the accompanying PowerPoint slides should have a blank space beside each term. Of course, there is no way to know whether students participate in these activities unless the instructor requires them to be submitted. Another method to encourage interaction is to pose a thoughtful, ethical, or controversial question, and ask students to email you their response or post their comments for class discussion.

## Tip 6: Provide a guided study tool

Guided study tools may help students focus their attention on key concepts during instruction.[40] Students in an undergraduate psychology course who wrote one to two sentence answers to guided questions while viewing an educational video scored significantly better on a post-test than students who did not have guided questions.[40] However, the study did not separate the contribution of note-taking and using a guiding tool to increased test scores. In a flipped classroom setting that used reading as the advance preparation method, students believed that reading assignments accompanied by guided reading questions positively impacted their motiva-

tion, reading comprehension, effort level, and understanding of material prior to attending class.[41]

In a similar manner, vodcasts can be accompanied by numbered questions or other prompts consistent with the order of the vodcast presentation. Bingo cards are an example of an accompanying prompt. For example, a bingo card accompanying a presentation on clinically important microbial species within a particular genus could have biochemical properties, virulence factors, or diseases in each box of the card. The student would then fill in the proper species for each box (or place a pre-made species marker in each box) as they progressed through the vodcast. In the case of an image-heavy pathology or anatomy presentation, the guided study tool could be images that the student identifies as they move through the presentation.

## Tip 7: Create animated interactions

A variety of animated interactions that require students to actively recall content can be built into vodcast productions. Working through a clinical case is a useful example. By animating the case content so that relevant sections appear on the instructor's mouse click, the instructor can walk students through the case, posing questions along the way and allowing time for students to formulate responses prior to revealing the next section of the case. Matching exercises also lend themselves to animation since arrows or lines can be animated into PowerPoint slides. After providing time for students to think about the correct way to match a given set of terms or phrases, the instructor simply clicks through the matched pairs to reveal the correct matches with the animated lines or arrows, adding any commentary as needed. Identification of images is another exercise that works well with this approach. The instructor pauses to allow students to identify an image, and then clicks to reveal the animated image label.

## Tip 8: Embed hyperlinks to interactive cases or games

Games, mobile applications, and virtual patient simulations have been used in medical curricula to promote learning, engagement, collaboration, real-world application, clinical decision-making, distance training, learning analytics, and swift feedback.[42] Medical students find games enjoyable and stimulating,[43–45] but evidence of their utility for increasing knowledge is conflicting, perhaps because of the limited number of rigorous studies.[46] To promote active engagement, links to interactive cases and games can be provided

in vodcasts. Websites with free, interactive cases include idimages.org (Partners Infectious Disease) and CDC.gov (Centers for Disease Control and Prevention). For example, the CDC has interactive case studies for health professions students on applied epidemiology topics that range from cigarette smoking and lung cancer to screening for antibody to HIV. The CDC also has short interactive monthly cases on parasitic disease topics.

One website with free, ready-made interactive games for health professions students is Nobelprize.org. This site houses games on blood typing, the double helix, immune responses, and control of the cell cycle, among others. Two useful websites with free tools for building interactive games are superteachertools.com and classtools.net. At the superteachertools site, instructors can build Jeopardy-like or Who Wants to be a Millionaire-style games, or a Speed Match review game. At the classtools site, options include a Connect Fours game to review connections between terms, and a Dustbin game where students have to drag the correct answer into the appropriate "bin" (the faster they do it, the better the score). PowerPoint also has free templates for games based on popular television shows, including *The Price is Right* and *Wheel of Fortune*. Alternatively, instructors can build a variety of interactive games using purchased software, for example C3 SoftWorks™.[45] The games could then be placed on the institution's learning management system for student play.

## Tip 9: Provide blank figures and tables for review

Summary tables, algorithms, and related diagrams are often included in vodcast presentations. If students are also provided blank copies of the diagrams in the PowerPoint slides that accompany vodcasts, they will have a convenient method to practice active retrieval of content when they are studying. Auditory instruction about the benefits of active retrieval may help motivate students to complete the diagrams.

## Tip 10: Include practice questions for reinforcement and review

There is substantial evidence that recalling information from memory by the use of questions or testing causes memory of that information to be strengthened.[47] Whether they are preparing for course exams or medical licensing exams, practice questions are highly valued by medical students.[10,48] Practice questions can run the gamut from simple recall to making connections between the concepts

taught. For practice questions in vodcasts produced with screen-capture software, the user can pause and work through a question, or can continue, and perhaps work on the question later. Practice questions can be woven throughout a vodcast, providing breaks, or can be used to conclude a presentation. To encourage active practice, answers should be provided at the end of the vodcast presentation, not alongside the relevant question. Another option is to provide practice questions as a separate file, using software such as Articulate Quizmaker™.

## Conclusion

To quote undergraduate medical students, vodcasts "can be put off" and are "easy to put off".[1] Students have myriad resources for their medical education. As such, the first goal in creating a vodcast is to motivate student use by addressing their preferences, particularly those known to facilitate multimedia engagement and learning. Second, given the widely recognized benefits of active learning, instructors should create vodcasts that include a variety of active learning elements. The creation and production of screen-capture type vodcasts that satisfy these requirements is within the technical abilities of most faculty.

## Disclosure

The author reports no conflicts of interest in this work.

## References

1. Schreiber BE, Fukuta J, Gordon F. Live lecture versus video podcast in undergraduate medical education: a randomised controlled trial. *BMC Med Educ.* 2010;10:68.
2. Biron VL, Harris M, Kurien G, et al. Teaching cricothyrotomy: a multisensory surgical education approach for final-year medical students. *J Surg Educ.* 2013;70(2):248–253.
3. Jones K, Doleman B, Lund J. Dialogue vodcasts: a qualitative assessment. *Med Educ.* 2013;47(11):1130–1131.
4. Kurien G, Biron VL, Campbell C, Cote DW, Ansari K. Can a multisensory teaching approach impart the necessary knowledge, skills, and confidence in the final year medical students to manage epistaxis? *J Otolaryngol Head Neck Surg.* 2013;42:51.
5. Matava CT, Rosen D, Siu E, Bould DM. eLearning among Canadian anesthesia residents: a survey of podcast use and content needs. *BMC Med Educ.* 2013;13:59.
6. Menashe S, Otjen J, Thapa MM. Techniques for creating video content for radiology education. *Radiographics.* 2014;34(7):1819–1823.
7. Hernandez M, Brown J, Foster J. A flipped-classroom model that integrates basic and clinical sciences in a new medical school: the first 2 years at the Alabama College of Osteopathic Medicine. *Med Sci Educ.* 2016;26(1):181–184.
8. Street SE, Gilliland KO, McNeil C, Royal K. The flipped classroom improved medical student performance and satisfaction in a pre-clinical physiology course. *Med Sci Educ.* 2015;25(1):35–43.
9. Szarek JL, Boardman JM, White M, Holt JT. Integrated and flipped: 5 years' experience of integrating active learning in an integrated course. *Med Sci Educ.* 2016;26(1):159–167.

10. Pettit RK, Kinney M, McCoy L. A descriptive, cross-sectional study of medical student preferences for vodcast design, format and pedagogical approach. *BMC Med Educ.* 2017;17:89.
11. Sandars J. Twelve tips for using podcasts in medical education. *Med Teach.* 2009;31(5):387–389.
12. Kumar AB, Hata JS, Bayman EO, Krishnan S. Implementing a hybrid web-based curriculum for an elective medical student clerkship in a busy surgical intensive care unit (ICU): effect on test and satisfaction scores. *J Surg Educ.* 2013;70(1):109–116.
13. Bossaer JB, Panus P, Stewart DW, Hagemeier NE, George J. Student performance in a pharmacotherapy oncology module before and after flipping the classroom. *Am J Pharm Educ.* 2016;80(2):31.
14. Back DA, von Malotky J, Sostmann K, Hube R, Peters H, Hoff E. Superior gain in knowledge by podcasts versus text-based learning in teaching orthopedics: a randomized controlled trail. *J Surg Educ.* 2017;74(1):154–160.
15. Prunuske AJ, Henn L, Brearley AM, Prunuske J. A randomized crossover design to assess learning impact and student preference for active and passive online learning modules. *Med Sci Educ.* 2016;26:135–141.
16. Freeman S, Eddy SL, McDonough M, et al. Active learning increases student performance in science, engineering, and mathematics. *Proc Natl Acad Sci U S A.* 2014;111(23):8410–8415.
17. Cook DA, Levinson AJ, Garside S, Dupras DM, Erwin PJ, Montori VM. Instructional design variations in internet-based learning for health professions education: a systematic review and meta-analysis. *Acad Med.* 2010;85(5):909–922.
18. Kay RH. Exploring the use of video podcasts in education: a comprehensive review of the literature. *Comput Human Behav.* 2012;28(3):820–831.
19. Zhang D, Zhou L, Briggs RO, Nunamaker JF Jr. Instructional video in e-learning: assessing the impact of interactive video on learning effectiveness. *Inf Manag.* 2006;43(1):15–27.
20. Mayer RE. Applying the science of learning: evidence-based principles for the design of multimedia instruction. *Am Psychol.* 2008;63(8): 760–769.
21. Guo PJ, Kim J, Rubin R. How video production affects student engagement: an empirical study of MOOC videos. In: *Proceedings of the First ACM Conference on Learning at Scale (L@S).* New York, NY: Association for Computing Machinery; 2014:41–50.
22. Brame CJ. Effective educational videos. Vanderbilt University Web site; 2015. Available from: http://cft.vanderbilt.edu/guides-sub-pages/effective-educational-videos/. Accessed March 1, 2016.
23. Dong C, Goh PS. Twelve tips for the effective use of videos in medical education. *Med Teach.* 2015;37(2):140–145.
24. Barkley EF. *Student Engagement Techniques: A Handbook for College Faculty.* San Francisco, CA: John Wiley & Sons; 2009.
25. Kusurkar RA, Ten Cate TJ, van Asperen M, Croiset G. Motivation as an independent and a dependent variable in medical education: a review of the literature. *Med Teach.* 2011;33(5):e242–e262.
26. Roehling PV, Vander Kooi TL, Dykema S, Quisenberry B, Vandlen C. Engaging the millennial generation in class discussions. *Coll Teach.* 2011;59(1):1–6.
27. Lujan HL, DiCarlo SE. First-year medical students prefer multiple learning styles. *Adv Physiol Educ.* 2006;30(1):13–16.
28. Sharma N, Lau CS, Doherty I, Harbutt D. How we flipped the medical classroom. *Med Teach.* 2015;37(4):327–330.
29. Pettit RK, McCoy L, Kinney M. What millennial medical students say about flipped learning. *Adv Med Educ Pract.* 2017;8:487–497.
30. Mayer RE, Moreno R. Nine ways to reduce cognitive load in multimedia learning. *Educ Psychol.* 2003;38(1):43–52.
31. Mayer RE, Moreno R. A split-attention effect in multimedia learning: evidence for dual processing systems in working memory. *J Educ Psychol.* 1998;90(2):312–320.
32. Ibrahim M, Antonenko PD, Greenwood CM, Wheeler D. Effects of segmenting, signalling, and weeding on learning from educational video. *Learn Media* Technol. 2012;37(3):220–235.

33. Finkbeiner KM, Russell PN, Helton WS. Rest improves performance, nature improves happiness: assessment of break periods on the abbreviated vigilance task. *Conscious Cogn.* 2016;42:277–285.

34. Kiewra KA. The relationship between notetaking over an extended period and actual course-related achievement. *Coll Stud J.* 1983;17(4):381–385.

35. Titsworth BS, Kiewra KA. Spoken organizational lecture cues and student notetaking as facilitators of student learning. *Contemp Educ Psychol.* 2004;29(4):447–461.

36. Kiewra KA. Notetaking and review: the research and its implications. *Instr Sci.* 1987;16(3):233–249.

37. Kiewra KA. Students' notetaking behaviors and the efficacy of providing the instructor's notes for review. *Contemp Educ Psychol.* 1985;10(4):378–386.

38. Morrison EH, McLaughlin C, Rucker L. Medical students' note-taking in a medical biochemistry course: an initial exploration. *Med Educ.* 2002;36(4):384–386.

39. Guy R, Byrne B, Rich P. Supporting physiology learning: the development of interactive concept-based video clips. *Adv Physiol Educ.* 2014;38(1):96–98.

40. Lawson TJ, Bodle JH, Houlette MA, Haubner RR. Guiding questions enhance student learning from educational videos. *Teach Psychol.* 2006;33(1):31–33.

41. Brown CA, Danvers K, Doran DT. Student perceptions on using guided reading questions to motivate student reading in the flipped classroom. *Account Educ.* 2016;25(3):256–271.

42. McCoy L, Lewis JH, Dalton D. Gamification and multimedia for medical education: a landscape review. *J Am Osteopath Assoc.* 2016;116(1):22–34.

43. O'Leary S, Diepenhorst L, Churley-Strom R, Magrane D. Educational games in an obstetrics and gynecology core curriculum. *Am J Obstet Gynecol.* 2005;193(5):1848–1851.

44. Shiroma PR, Massa AA, Alarcon RD. Using game format to teach psychopharmacology to medical students. *Med Teach.* 2011;33(2):156–160.

45. Pettit RK, McCoy L, Kinney M, Schwartz FN. A multimedia audience response game show for medical education. *Med Sci Educ.* 2014;24(2):181–187.

46. Akl EA, Pretorius RW, Sackett K, et al. The effect of educational games on medical students' learning outcomes: a systematic review. BEME Guide No 14. *Med Teach.* 2010;32(1):16–27.

47. Roediger HL III, Karpicke JD. The power of testing memory: basic research and implications for educational practice. *Perspect Psychol Sci.* 2006;1(3):181–210.

48. Deng F, Gluckstein JA, Larsen DP. Student-directed retrieval practice is a predictor of medical licensing examination performance. *Perspect Med Educ.* 2015;4(6):308–313.