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Pause for Thought: Designing Video Content that Doesn't Overwhelm Learners

Abstract: Easy-to-use software and apps have made video creation achievable and affordable for many library and information professionals. While there are parallels between delivering library training in-person and via a pre-recorded video, video creation does present additional challenges as well as exciting opportunities. This paper, by Charlie Brampton, uses Clark and Mayer's model of cognitive processing as a framework, and explores how video watching can lead to extraneous, essential and generative processing. These three concepts are explored individually, and practical advice is given about controlling each type of processing. The related topic of video accessibility is discussed, from both a legal and a practical perspective.
Keywords: cognitive processing; video information processing; teaching; learning; technologies

INTRODUCTION

Thanks to an ever-growing field of user-friendly software and mobile phone apps, video creation and editing have become affordable and achievable activities for many library and information professionals. Outputs may include videos that walk library users through a database or current awareness tool, or that provide answers to frequently asked questions. While not replacing other activities such as face-to-face training or written training guides, videos can be a valuable tool for any librarian.

The lockdowns during the COVID-19 pandemic were a catalyst for many of us to create video content, since other opportunities for delivering training were restricted or unavailable. This paper encourages you to think about how your library users process the information that they receive while watching your training videos. You are invited to reflect on what a usable, accessible video looks like and how you can integrate some simple recommendations when you make your next video. This paper uses the term 'video' to mean something that is pre-recorded and usually shared with learners in an asynchronous manner. There are, however, significant parallels with both synchronous online training (e.g. on Zoom or Microsoft Teams) and in-person training.

THE BUILDING BLOCKS OF VIDEOS

Creating video content may seem like a daunting task to those of us who are used to teaching library users face-to-face or through synchronous online teaching.

Sam Brenton provides a reassuring reminder that we are, in fact, building on what we already know about teaching and learning:

> *We don't jettison all the things we know help to make teaching successful when we start teaching online. Indeed, it is useful to resist the temptation to rush in with particular tools* […] *and first think about how we are going to teach and by the same token how we are going to ask students to learn.*[1]

Starting here helps ground us and stops us from being either 'bogged down in - or dazzled by - the latest technologies for their own sakes'.[2] We can think about sessions we have run for either the same cohort of learners or previous cohorts, and what worked well and what was less effective. We can think about what we want our learners to have achieved by the end of the video and then work backwards in order to plan a path for them to reach that objective. In this respect, planning a video is very similar to planning a face-to-face session.

An important feature of video learning is the opportunity to pause, rewind, skip ahead or change playback speed. These tools can give the instructor some 'breathing space' as individual learners can each make their own adjustments to make the video work best for them.

As Brenton acknowledges, when creating teaching materials we need to understand how we are going to ask our library users to learn. This becomes easier to achieve if we know more about how our learners' brains work and what happens when they encounter material in a video format.

WHAT IS HAPPENING IN OUR USERS' BRAINS?

Processing video information is more complex than processing written information because there are (usually) two channels of communication being used simultaneously. While it is possible to create a silent video that just communicates information visually, it is typical for library videos to include both visual and audio information.

Figure 1 is a simplified model of what a learner's brain will do when watching a video. The two channels of communication are shown in the first column, labelled 'video'. When watching a video, words can be received in two different ways: visually on the screen or aurally. In the second column, both the eyes and the ears receive sensory information which is then transmitted to the brain. Crucially, there is a selection process here. Some sounds (a door opening in the background, for instance) may be immediately discarded. Sometimes, significant information can be ignored or discarded too, particularly if the viewer is overwhelmed or distracted.

The working memory can, according to a much-quoted finding from George Miller, hold 'seven plus or minus two' pieces of information at any one time.[4] Incoming material is rapidly synthesised at this stage, and we hope much of it is retained in the long term memory. Note the important integration process that has to occur for this to happen. The information we are conveying is more likely to be retained if our learners can 'hook' it on to something, perhaps something they've learnt earlier.

This final stage of the model sees learning through a constructivist lens. This isn't just the addition of new knowledge to the slush pile of existing knowledge. Rather, existing knowledge is constantly shaped and adjusted by the incoming information. Learning is seen as 'an active process of individual transformation and changes in understanding.'[5]

If we were to teach in-person with PowerPoint slides or a whiteboard, learners would also be processing these two channels of information, and the model of learning would look very similar. Again, this illustrates how - despite the technical differences - there are many overlaps between video creation and face-to-face teaching. Yet, as Schreiber argues, videos and their inherent features (e.g the ability to pause) provide many additional benefits to learners attempting to select, organise and integrate new information.[6]

As the model in figure 1 suggests, we should strive to create teaching materials that encourage our learners to select, organise and - crucially - integrate knowledge. We all have a finite processing capacity, so we need to design our videos in such a way that this activity is encouraged.[7]

We will shortly go on to explore three types of processing that our learners' brains may do as they receive information from a video. You may find it helpful to consider how much can be applied to face-to-face teaching as well as to videos.

These three demands on cognitive processing are:

- Extraneous processing
- Essential processing
- Generative processing

Let's explore these in turn.

EXTRANEOUS PROCESSING

The first type of processing that we'll consider is extraneous processing. This is 'cognitive processing that does not support the instructional objective'[8] and is often caused by the instructor paying insufficient attention to layout and content.

If a section of a training video deals with, for instance, European legislation, then the viewer should be encouraged to devote as much of their attention as possible to this content. The instructor can facilitate this by minimising unnecessary illustrations or superfluous content. When content is dry or complicated, so-called 'seductive details' are often inserted in an attempt to hold viewers' attention.[9] However, with a limited amount of processing capacity available, such details are a distraction for viewers. Features such as illustrations *can* still play a part in a video, but they shouldn't be competing with substantive content for the viewers' attention.

Images are not the only feature that can affect extraneous processing. It is also possible for text to create extraneous processing, if it is not relevant. If you are creating a video with written text, consider whether every word on

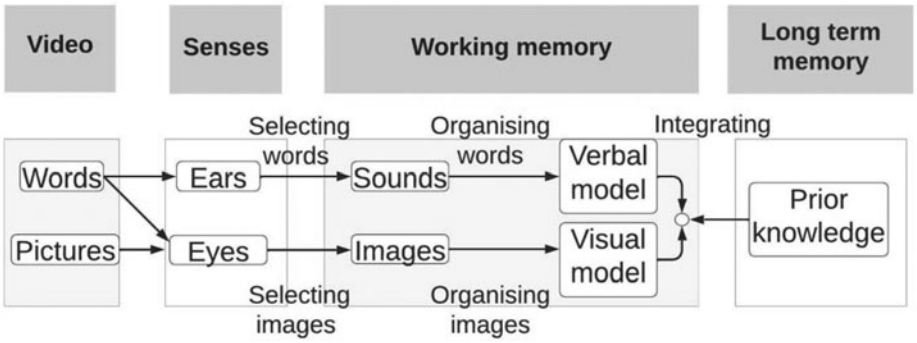

Figure 1: The cognitive theory of video information processing.[3]

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the screen is necessary, or whether anything can be rephrased or reduced. Clark and Mayer summarise evidence from a number of experiments where students watched different multimedia presentations on a topic and were then tested on the content. Interestingly, the students who had been exposed to the 'lean' text recalled more details than those who had seen more verbose content.[10]

As well as minimising superfluous or 'seductive' content, Clark and Mayer also recommend applying the 'redundancy principle' when planning your video content.[11] Many of us have fidgeted through live sessions where the presenter has merely read the text of their PowerPoint slides aloud, without providing any additional content. One of those methods is redundant i.e. the words could either be displayed visually or spoken aloud but there is no need to have both. While this can bore or frustrate learners, it also forces their brains to engage in extraneous processing as they encounter the same information twice.

Refer back to Figure 1 and note how the working memory is constructing two models: one verbal and one visual. If there is visual information (for instance screenshots or a walkthrough of a legal research tool) then this is received by the eyes and may be integrated into the working memory's visual model. If there is corresponding audio description or narration then this is processed by the ears and may be integrated into the verbal model. However, if there is *also* written text on the screen to read, then the finite visual processing resources have to work with both the images and (initially, at least) this written text. If the video is moving at a fast pace or if much of the content is unfamiliar to the learner, then this can lead to cognitive overload. Judicious application of the redundancy principle would avoid this unnecessary duplication of information and the resulting increase in extraneous processing.

However, just as the lesson from the earlier discussion of 'seductive' images was not 'using images is bad', the recommendation here is *not* 'do not use written text in videos'. There are some occasions where written text will help your learners, not overwhelm them. For example, if your video is introducing unfamiliar words or names that may not be in your learners' vocabularies, then seeing them written down can help. Similarly, if new information is being introduced at a reasonably slow pace, then there may be scope for using text on screen as learners will have the time to process this additional information.

ESSENTIAL PROCESSING

However, it is not just extraneous content that can overwhelm learners' cognitive processing capacity. Even if lean text is used and seductive details minimised, the intrinsic complexity of the video's subject matter can make a video seem overwhelming.

Clark and Mayer note a difference between extraneous processing and essential processing[12]. Whereas the video content leading to extraneous processing can be easily discarded, the video content that drives essential processing is the important, information-carrying part of the video. While essential processing is important, there is still a limited capacity for processing such information. It is akin to fruit and vegetables. While there are clear health benefits to eating them, one cannot eat enormous quantities of them in one go!

One approach that video creators can take is to segment video content. Segmentation in this context means producing a series or playlist of shorter videos in place of one longer one. Beatty, Merchant and Albert explored students' preferences and note that the majority of students prefer shorter, segmented video content, although this preference is less marked in high-achieving students.[13] What is more pertinent, however, is whether segmenting video content affects outcomes such as the retention of information.

Roxana Moreno tested this idea with education students, giving some students segmented video materials and comparing their test scores to a group of students receiving non-segmented video and also to a control group who received no video materials.[14] Segmentation led to a significant increase in the number of students recalling key information from the video. Moreno concludes that segmentation 'allows novice students to reduce cognitive load by minimising the amount of information that needs to be processed in working memory at one time.'[15]

If a topic needs to be revisited, it is easier for learners to find it in a series of short, focused videos than in a single longer video. Beatty, Merchant and Albert reported a tailing off in video watching, whereby most students would watch the first video in a series but that ever fewer would watch each subsequent video. They provide some practical advice to help avoid this including:

1. Frontloading the content, so that the most important information is shared in the first video
2. Ensuring each video has unique content that is not available in any other video (and telling students that the videos have been designed in this way).[16]

GENERATIVE PROCESSING

Unlike extraneous processing (which needs to be minimised) or essential processing (which needs to be carefully managed), generative processing is something video creators should aim to maximise. The smaller the cognitive load that is taken up by extraneous content, the more scope there is for generative processing. This form of processing allows a deeper engagement with knowledge, and facilitates the processes of organising and selecting shown in figure 1.[17]

Clark and Mayer offer several approaches to enhance and encourage generative processing. The first is to create content that makes learners feel like they are in a conversation with the video creator. This does not necessarily mean producing an informal or chatty video. Usually the video's subject matter and intended audience will be a good guide to how formal the video's language

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and style should be. Rather, consider whether a sentence that starts 'all trainees should be able to…' could be rephrased as 'you should be able to…'. Such social cues make the learner feel involved, and thus more likely to engage with the content and to begin organising and implementing the new knowledge.[18]

Clark and Mayer cite the work of Beck and colleagues, who argue that people put a greater effort into understanding content when they feel they are in a conversation with someone rather than when they feel they are just passively receiving information.[19]

When we are in a conversation, there is a reciprocal flow of information. Even if the conversation is dominated by one speaker, that person should (hopefully!) check in with their listener, ask them questions or give them space to ask their own questions. This is difficult to replicate with asynchronous video content, but such interactivity is the second of Clark and Mayer's recommendations for how to increase generative processing.[20]

Fortunately, many of the commonly-used video creation platforms allow creators to insert quizzes or polls. Quizzes and polls give learners the opportunity to move from passive video watching to engagement and action. Depending on the tool being used, learners may then receive instant feedback on their response, making them feel like they are participating in an exchange of information.

ACCESSIBILITY

In September 2018, new regulations on accessibility came into force in the UK[21]. As a result, public sector web content now needs to meet minimum accessibility standards. The Government's Central Data and Digital Office confirmed that these regulations apply to most universities and colleges as they are in receipt of public funding.[22] Yet, accessibility always matters with video content, even in those instances where the legislation does not apply. Many organisations and institutions encourage their employees to adhere to WCAG 2.1[23] or other accessibility standards, so it's worth acquainting yourself with in-house guidelines and expectations before creating video content.

As Terrill Thompson notes, the explosion of video content offers many benefits to learners but groups of users can be excluded, unless content is 'produced and delivered with universal design in mind.'[24]

Happily, much of the good practice about minimising extraneous processing, managing essential processing and encouraging generative processing that this article has explored also helps make video content more accessible. For instance, stripping back superfluous images or other visual content in order to minimise extraneous processing will also assist learners with a visual impairment.

And while accessibility is often framed in the language of disability and reasonable adjustments, there is a larger benefit to making videos more accessible. For instance captions are essential for learners who are d/Deaf or hard of hearing. Yet other learners may be watching videos in a noisy environment or, conversely, a very quiet environment such as a library. In both of these circumstances, it's impractical to access the audio content of a video. So captions can have a wider benefit than the one intended[25].

FINAL THOUGHTS

For some learners, short accessible videos made using some of the guidelines above may be their first encounter with your library and its resources. Think about what you'd like them to have learnt and how you want them to feel when they reach the end of your video. Then work backwards from there and think about what you can say and do to help the video meet those needs. Understanding the principles of finite processing capacity is valuable, as it enables us to design videos that are informative but not overwhelming. If you're still trepidatious, just have a go! Ask people who watch your videos for feedback, and see which video tools work best for you and your users. Good luck!

Footnotes

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[2] ibid 149.

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[25] ibid 260.

Biography

Charlie Brampton is a chartered librarian, with a background in academic libraries, as well as health and scientific libraries. She has an MSc in Information and Library Management from UWE and is an Associate Fellow of Advance HE. As an Academic Liaison Librarian, Charlie provides training and support to undergraduate and postgraduate law students, and law staff. She also co-ordinates the social media work at Oxford Brookes library, and has helped colleagues to refine their social media and video creation skills. Charlie is enthusiastic about new technologies and tools, but remains realistic about what can be realistically achieved by library and information management staff with a busy workload. ORCID: 0000-0001-7769-159X

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