An investigation into pathology staff's use and perceptions of online training videos in support of laboratory bench training.

Wendy Leversuch (Health Services Laboratories)

Introduction

HSL in partnership with UCL, supported the Government's response to the pandemic though the creation of a purpose-built pillar 2 COVID-19 testing laboratory. The creation of this new laboratory resulted in large-scale recruitment of a new group of staff, who would all need to be trained and competent in a matter of weeks. This presented the unique challenge of needing to train staff whilst the laboratory space they would be working in was still being built.

A training programme was developed consisting of instructional videos demonstrating both the use of a safety cabinet and the various stages of the COVID-19 test. Each topic had an online course available on our workplace Learning Management System 'Sonic Learn'. Staff were required to complete these online courses before attending a 'practice laboratory' where they then had a chance to undertake the procedure in a safe environment under direct supervision.

Training is a resource-intensive process which can be challenging to deliver due to an ever-increasing workload and quick turn-around times that are critical for patient care. The traditional approach to laboratory training can often be captured by the familiar phrase 'see one, do one, teach one'. A trainee will observe a process, whilst the trainer explains the steps and the principles behind the process. Once the trainee is familiar with the process, they move onto performing the process themselves under direct supervision of the trainer. After a period of practice under supervision, the trainee then undergoes a competency assessment where their knowledge and skill are assessed to determine their level of competency and whether they can then perform the process unsupervised – refer to **fig 1**.

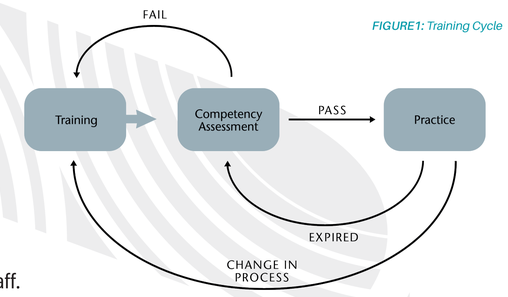


FIGURE1: Training Cycle

This study aimed to review the use of these instructional videos within laboratory training with the anticipated benefit that use of this type of multimedia would reduce the resource needed to train staff.

Method

Ethical approval was granted from the UCL Culture Communications and Media department.

Staff who had completed either the 'COVID-19 Test' or 'Safety Cabinet' course were invited to participate in the study. Following a process of informed consent, the participants were asked to complete an online questionnaire and participate in a semi-structured interview to gather their experiences and view of these courses. Additional user data was gathered from Sonic Learn to provide data for triangulation and evidence of the learners' interactions with the course.

The questionnaire included a range of question types including, both open (free text responses) and closed (fixed option responses) questions and Likert style questions (indicator of attitude).

Semi-structured interviews were carried out over Microsoft Teams and transcripts underwent thematic analysis[6]. This project took a deductive approach with predefined broad themes identified from the literature review and was in keeping with the chosen epistemological scientific paradigm selected for this project.

Results

A total of 38 staff completed the questionnaire and 3 staff took part in a follow up interview. This study offerred a wide range of findings. Some key points are noted below

Results indicated that the videos were well received and considered to be easily accessible and 'very helpful' in being able to confidently perform the relevant task. The majority of respondents found the videos to be most helpful as a pre-learning exercise before practical training and there was a consensus view that they have potential at reducing the amount of face-to-face training needed. However, it was widely felt that this could only ever support face-to-face training and not replace it.

ACCESSIBILITY - 100% of participants to the question confirmed they had no issues accessing the videos. This supported the choice of using Sonic Learn as the delivery mode for this learning.

LENGTH OF VIDEOS - The duration of the videos in this study ranged from 2 minutes 53 seconds to 5 minutes 14 seconds with a mean time of 4 minutes 26 seconds. Participants overwhelmingly stated that the length of the videos was 'just right'.

CONFIDENCE - Participants, in response to the question 'How helpful did you find these videos?' demonstrated a consistent opinion that they were very helpful.

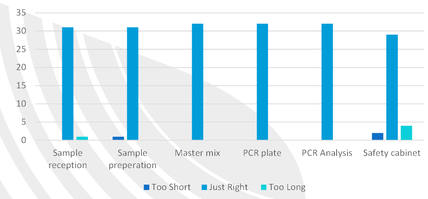
RESOURCE - Participants were asked whether they thought completing the course reduced the amount of face-to-face training they needed to be competent. This was a crucial question as it relates back to the premise of this research project as to whether the use of instructional video can help ease the training burden within laboratories. Results indicated a majority thought the videos did reduce the amount of face-to-face training needed.

Participants were asked to provide justification for their response, following thematic analysis there was a clear opinion that the videos provided the most value as preparatory support prior to face-to-face training.

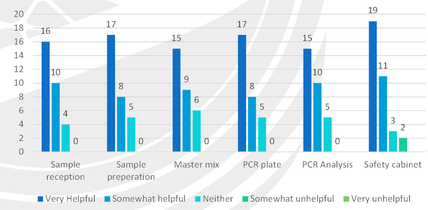
Interview comments supported the opinion that instructional videos were useful and best placed at the start of the training pathway, as preparation for face-to-face training.

- *"Yeah, it really did… knowing what I saw from the video beforehand, it gave me that head start in what I actually needed to do in the procedure and how to start"*
- *"Yeah 'cause I think. I think if people have got the background knowledge already and they've already done it…It's much easier just to go through that with them one to one."*
- *"So I saw the videos beforehand and then I was able to go into the work remembering what I had seen in the videos"*
- *"I'm someone who works well with visual representations, able to like picture it as I was sitting there in the lab so that I was remembering"*
- *"Obviously if you're being shown something on a bench then one to one is the is the best. Although having some sort of background prior to doing the manual stuff is also important to having that pre learning that background… Yeah 'cause I think. I think if people have got the background knowledge already…they already know why they have to use a safety cabinet, they already know what the different parts of the safety cabinet are"*
- *"It's to compliment the practical training and should be done before you have the practical training"*

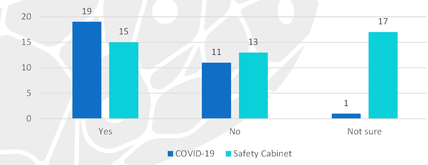
Response to "How did you find the length of videos?" (n=32)



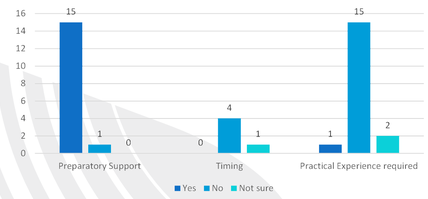
Response to "How helpful did you find these videos?" (n=30)



Response to "Do you think completing the course reduced the amount of face-to-face training needed to be competent?" (n=31)



Number of comments made per theme (n=40)



Theoretical Framework

The study used Mayer's Cognitive Theory of Multimedia Learning[1] which states that people learn better from a combination of words and pictures rather than words alone to provide a theoretical justification for the potential of instructional videos to support laboratory training. It sits under the broad learning theory of cognitivism which considers information to be actively processed within the mind of the learner and behaviour is modified by searching for relationships between information[2].

This theory embeds three assumptions as to how an individual receive and assimilate information; these are:

- Dual-Channel assumption (information processed via two channels, the visual (eyes) channel, and the auditory (ears) channel).
- Limited Capacity assumption (can only process a limited amount of information at any one time in any channel).
- Active Processing assumption (humans engage in active cognitive processes to create connections between the information they have received).

Understanding the principles of this learning theory is important when designing multimedia content and evaluating its effectiveness. Not all multimedia is of the same learning value, and it is possible to create poor multimedia content that does not result in any learning. The dual channels assumption reminds designers that multimedia content can include both audio and visual elements and that it is best to include a combination of both as information presented solely in a visual or audio format does not enable the learner to engage with the content effectively. However, the limited capacity assumption that learners are limited in the amount of information they can process at any given time implies it is possible to overload a learner by presenting too much information at once. A learner can either read the text or watch the procedure but cannot do both at the same time, this cognitive overload can result in reduced learning, and this situation is described as the 'split-attention effect'[3].

When considering how this theory of learning can be put in the context of laboratory training, it must be applied to the objective of the laboratory training, competency. It is not proposed that a state of competence can be achieved through multimedia learning alone, even when considering advanced multimedia environments such as VR laboratories, but research has shown this to offer the best learning gains when used as part of a blended learning approach [4,5].

Outcomes

Based on the conclusions drawn from the data above it was possible to propose a revised training and competency cycle including the use of instructional videos. This study has shown that the timing and placement of instructional videos within the training cycle is crucial, and I have shown that they are best used as a preparatory activity prior to undertaking practical training and has been supported through triangulation,evidenced through multiple data sources. See **fig 2** for the proposed, updated training and competency cycle.

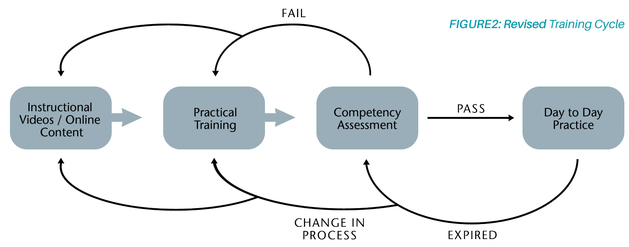


FIGURE2: Revised Training Cycle

I can also propose a set of design decisions that will inform creation of future laboratory instructional videos:

TABLE 2: Design guidance for laboratory instructional videos

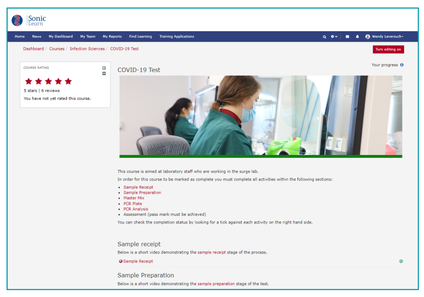
Theme	Advice
Accessibility	Sonic Learn is a suitable place to host content that all staff can access.
Authenticity	Important to make sure you use the same equipment that will be used when undertaking the procedure normally.
Narration	Ensure narration supports a visual demonstration not reading out the same text on a screen.
Length of videos	Keep videos short, it is better to break down a topic into multiple short videos than have one long one.
Use of videos	Consider how the video will be placed in the training programme. It is best to use videos as preparation for practical training and a resource for staff to refer to them.

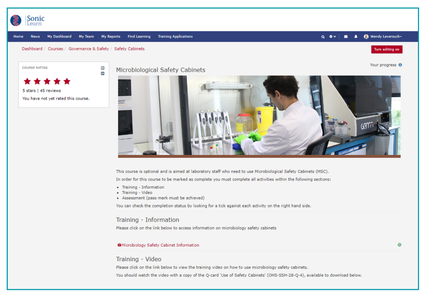
Future Investigations

This study has clearly demonstrated the potential for research in the use of educational technology in laboratory training in the workplace and has highlighted a lack of research in the training of pathology staff. There are elements within this study that have been noted as areas worth further investigation such as exploring multiple views of the videos, the use of captioning, and the time elapsed between watching the videos and undertaking the practical training.

This area of study can also move forward with an experimental design and use of experimental and control groups, one following the original training and competency cycle (**fig 1**) and the other following the updated cycle (**fig 2**). Both groups could be evaluated on the time it takes to achieve a competent state as determined by the local competency assessment. This study could be further enhanced by ensuring the same trainers work across both groups and are interviewed to ascertain their views on how the two groups performed.

There is also the potential to carry out a similarly designed experiment looking at different types of technology such as virtual reality laboratory simulations.





FIGURES 3 & 4: Screenshots from the Sonic Learn Website

REFERENCES

1. Mayer RE. Multimedia Learning: Cambridge University Press; 2021.
2. Bates B. Learning Theories Simplified: and how to apply them to teaching: Sage; 2019.
3. Mayer, R. E., & Moreno, R. (2003). Nine ways to reduce cognitive load in multimedia learning. Educational psychologist, 38(1), 43-52
4. De Vries, L. E., & May, M. (2019). Virtual laboratory simulation in the education of laboratory technicians–motivation and study intensity. Biochemistry and Molecular Biology Education, 47(3), 257-262.
5. Smith, C. L., Coleman, S. K., & Ferrier, C. (2019). Employer and work-based student perceptions of virtual laboratory teaching and assessment resources. Work Based Learning e-Journal International, 8(1), 53-70.
6. Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative research in psychology, 3(2), 77-101.