education in chemistry

Curate video content to capture students' attention

By Fraser Scott | 21 March 2023

Top tips to pick multimedia content with low cognitive load and high learning outcomes

Source: © Sorbetto/Getty Images

Students and screens: there's a definite attraction. Use this to your advantage in the classroom by keeping them focused with multimedia chemistry content

The Covid-19 pandemic saw a shift in teachers everywhere increasing their use of and reliance on various multimedia resources, such as YouTube videos. Post-lockdown, these resources remain a key component in our teaching toolkit. How easy is it to identify a good resource among the many that are available?

Choose videos with low cognitive load

The rise in use of multimedia in teaching has lead to an increasing interest in investigating its effectiveness. The intersection of cognitive load theory and information processing with multimedia resources has lead to the development of guidelines for the design and use of multimedia. One such set of guidelines is Mayer's multimedia principles.

In this framework, there are 12 principles of multimedia learning, arranged into three categories, each intended to reduce unnecessary cognitive load during instruction. The categories are:

- reduction of extraneous processing;
- management of essential processing; and
- fostering of generative processing.

Extraneous processing is processing information unrelated to the intended learning goal, such as background music in a YouTube video. We need to minimise this extra cognitive load.

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Essential processing occurs when processing goal-relevant words and images. We need to manage this cognitive load as it's necessary for learning. We can reduce this by getting students to focus on a simpler task, for example.

This research will help you select multimedia that effectively supports learning

Generative processing is when a learner makes sense of the information they have interacted with. This is called germane cognitive load and we should maximise it during a task, as this is when the learning occurs. However, since a student's cognitive load capacity is finite, the extraneous and essential cognitive loads need to be low enough so there is capacity left for the germane load.

In a new study, researchers use Mayer's multimedia principles to evaluate instructional chemistry YouTube videos across three key topics: chemical bonding, acids and bases and intermolecular forces.

Teaching tips

- We should be looking for more than error-free chemistry content to determine the quality of a multimedia resource. Mayer's principles help ensure that a resource avoids unproductive cognitive load. You can familiarise yourself with these principles by reading this study – it contains helpful, easy-to-understand summaries.
- Be careful – the most prolific and popular content creators are not necessarily producing the most effective videos. Some regularly violate one or more of Mayer's principles.
- If a video isn't perfect, you can add information to make it better. For example, if the video doesn't include a list or scheme of content, you can create it. When videos violate the coherency principle (with unnecessary information), you can address this in class. However, it's important to remember that this may cause further distraction if done too often.

What to look out for

In the study, most videos included unnecessary and potentially distracting, images and sounds. This violates Mayer's coherence principle, which relates to the extraneous processing category. Also, many videos did not provide a list or scheme of the organisation of the content, which violates Mayer's signalling principle. This is another of the principles within the extraneous processing category.

In general, there was much less variability in the other codes used to categorise the videos. There was also no statistical difference between the three different chemistry topics in how they stuck to the principles. Interestingly, the videos were categorised by how prolific a content creator was, with very little differences between prolific compared to non-prolific.

This research will help you select multimedia that effectively supports learning. The YouTube videos analysed in this research represent some of the most viewed educational chemistry content.

References

K Q Magnone *et al*, *J. Chem. Educ.* 2023, **100 (2)**, 432–441 (DOI: 10.1021/acs.jchemed.2c00591)