# Handout 2.1

Based on Richard E. Mayer and Roxana Moreno, "Nine Ways to Reduce Cognitive Load in Multimedia Learning," Educational Psychologist, 38(1), 43–52 (2003)

**1. Present diagrams with narration rather than with text.**
Students show better comprehension of concepts presented as diagrams/animations paired with spoken explanation. Presenting both a graph and written text overloads the visual learning system while failing to employ the auditory one. A graph presented with a verbal explanation employs both the visual and auditory systems, resulting in more effective transmission of information.

**2. Present explanations in paced segments.**
Students show better comprehension of explanations when they are presented in paced, student-controlled segments rather than as continuous presentations. The pause allows students to solidify understanding of one concept before being presented with another. Ask students if they are ready to continue once a unit is complete, or offer a 'question session' after each main concept is presented in the lesson.

**3. Provide students with background information before class.**
By pre-training students, they waste less time attempting to understand logistical aspects of the lesson and rather focus on the abstract concepts and ideas. Providing all students with a vocabulary sheet at the start of the scheme of work would be a great example of incorporating this. This way students participate in each lesson and are not distracted by attempts to remember domain specific vocabulary.

**4. Eliminate extraneous information, sounds, and images.**
It is believed that unnecessary factors 'take up' cognitive processing away from necessary ones. The idea here is that students will be confused by the abundance of information and the need to sift through it to understand which concepts are relevant. Incorporating this idea means prudence when creating PowerPoint slides. One must be careful to only include relevant information and not be swayed by the novelty of including elaborate explanations or unnecessary tangents.

**5. Highlight key information.**
For presentations that must include detailed information, students show better understanding when educators signal which information is important. An easy way to incorporate this concept would be providing students with a small outline listing the main objectives of lesson or scheme of work. The use of bolding, underlining, and colours to indicate importance is another possible technique.

**6. Place image-relevant text near the corresponding image.**
The assumption here is that students spend less time attempting to attach the image to the text and therefore have more cognitive capacity left over to understand more abstract concepts.

**7. Present multimedia and narration simultaneously.**
When presented with mixtures of narration and multimedia (i.e. a verbal explanation and an animation) students show better understanding if both forms are presented simultaneously rather than successively. For example, instead of lecturing on the water cycle and then showing an animation that also explains it, the explanation and the animation should be presented in a sequential, simultaneous manner. It is believed that by harnessing both the auditory and visual

systems and providing complementary information through each system, the student will not suffer from cognitive overload and will therefore better comprehend the concept being taught.

**8. Avoid on-screen text that duplicates your lesson.**
PowerPoint presentations should be relevant to your lesson but not be a word-by-word repetition. For example, do not provide a slide with written text that duplicates your spoken explanation of the key events in the civil rights movement. Presenting the exact same information in two places may result in cognitive overload.