

Cognitive loading of educational multimedia

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Background and Aims: Modern 3D-multimedia and e-learning necessitates revision of certain pedagogical theories (i.e. Cognitive Load Theory (CLT) (1), Multimedia Theory, Split Attention Effect (2), Redundancy Principle (3)). In our previous study we expected that students watching a 3D animation of a physiological process would score higher on a retention/transfer test than students viewing still images. We found no difference in learning and concluded that Extraneous Cognitive Load (ECL) was too high in our animation design (4). The aim of the present study was to investigate student-selected ECL preferences in an instructional 3D multimedia presentation.

Summary of work and outcomes: 41 Level 3 students (14M/27F) studying physiology (x11) or pharmacology (x30), were recruited with ethical approval. Pre-test questionnaires queried preferred learning styles and study habits (eg use of YouTube/background music). Students selected 1 of 6 versions of a 3D-animation, each with different ECLs (i.e. Voiceover; On-screen text; music) and answered questions designed to test recall and understanding. 80% of students selected both voiceover and text (contrary to the redundancy principal). 58% use music whilst studying but only 41% selected a presentation with music. 98% selected a voiceover. 27% selected Voice, Text & Music yet demonstrated no deleterious effects of cognitive overload. We found no significant differences in the (recall/understanding) test results.

Discussion: Given a choice of animation style, and flexible use, students performed equally well, despite different cognitive loads. The results challenged our assumptions based on pedagogical theories. With Virtual Reality(VR) close to becoming mainstream learning technology, we should examine and revise the theories and principles previously developed for 2D teaching.

Conclusions: 3D animation, YouTube, and soon Virtual Reality, will play an important role in future online learning. However, many of the pedagogical multimedia-based theories were developed for 2D instructional material. Student expectations and our ability to construct in-house 3D animations is a driver for new content creation. The results of the current and further studies will inform the wider community and will help to provide guidelines for modern instructional design.

References:

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