

SILC Showcase

Narratives of science in mind and media

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Narrative is a powerful way of making sense of the world: Through it, we string together our experiences with pieces of our prior knowledge, and formulate coherent causal explanations. Especially for novices, this can make complex systems such as evolution more cognitively accessible. At the same time, these narrative understandings are often pruned of crucial details, and riddled with misconceptions. Indeed, writers on science education have identified narrative as the language of folk theories.

But narrative is not a purely verbal phenomenon. Images also tell stories. That much of science is publicly communicated through images – including diagrams, charts, graphs, animations, and interactive multimedia – points to a need to better understand the interactions between the viewer and the visual in the construction of understanding.

In a series of related projects, we investigate what learners understand from visual representations intended to communicate scientific concepts. Specifically, what narrative understandings do they hold, and how are those narratives re-constructed through their interactions with media? Findings from these studies will inform the design of educational multimedia that we will develop to facilitate people's understandings of scientific concepts.

In one project, we consider the cladogram - a specialized diagram used by biologists to represent phylogenetic relationships among taxa. Students experience notorious difficulty when reasoning with them, and it may be that the visual structure too readily invites the misconceived narratives associated with naïve explanations of evolution (see Fig. 1). In these studies, we alter the presentation of the cladogram through animation, and thus impose narratives that counter the upward linear progression people tend to interpret. In clinical interviews, we then ask students to reason with these cladograms, and so attempt to tease apart the processes by which their narrative understandings interact with specific visual features of the diagram as they construct an interpretation of it. Follow-up studies will further investigate the influence of canonical folk understandings on interpretations of the diagram, and the graphic symbols students will intuitively draw to visually represent relationships. These findings will inform the design of an educational multimedia intervention to teach students how to view cladograms.

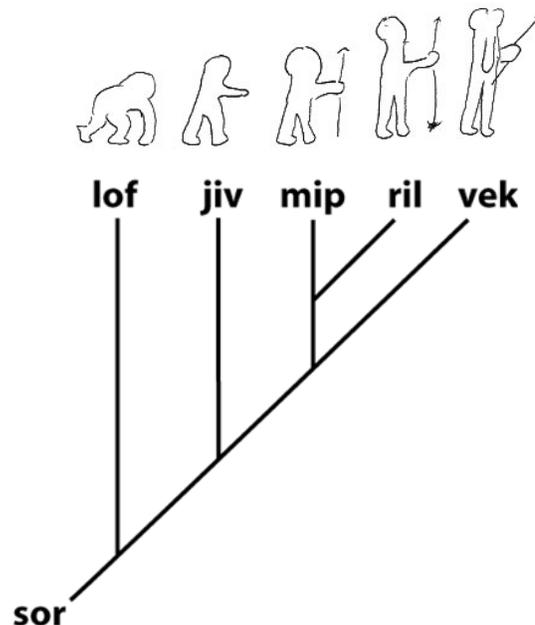


Figure 1. The image at the top is a sketch produced by a participant when asked to recall images of evolution. Here, it is juxtaposed with an image of a typical ladder cladogram to demonstrate the ease with which cladograms can be misinterpreted through simple linear narratives. The cladogram here is the one used in the studies described above, and in which nonsense words are used to avoid bias from participants' prior knowledge of familiar organisms.

In another study, we consider animated cartoons as media for communicating concepts of speciation and biogeography. These animations, on display at a natural history museum in Chicago, make use of a number of cinematic devices to compress complicated concepts into short, entertaining viewing times. In some cases, the animated depictions may literally contradict accurate portrayals of the underlying science (see Figure 2). How do design strategies such as anthropomorphism, temporal compression, and exaggeration, which are used to tell compelling narratives, interact with viewers' prior understandings of the concepts communicated? Interviews with students and museum visitors reveal different interpretations from viewers with little prior knowledge, compared to viewers with more solid understandings. Knowledge of how viewers construct meaning from watching these cartoons may inform more effective designs of educational animations.



Figure 2. Stills from the animation *Pollen and Seeds* (left) and *Biogeography* (right).