The role of process information in narrations while learning with animations and static pictures

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The role of process information in annotated narrations used for learning with animations compared to static pictures is examined. Previous research indicates benefits of animations over static pictures, especially when processes are to be learned. We assumed that narrations and in particular the amount of process information that is verbally explained might have a different effect on learning with animations or static pictures. Cognitive load theory and the redundancy principle suggest that it is important to eliminate redundant materials in learning environments. Therefore, delivering the same information – e.g. explained spatial and temporal changes – might have negative effects on cognitive load and learning outcomes.

To examine this assumption, nine different learning conditions consistent with a 3x3-design with visualization (no visualization vs. static pictures vs. animation) and narration (no narration vs. no process narration vs. process narration) as independent variables were created. Learning outcomes were measured in the post knowledge test which consisted of 18 questions in total. To assess cognitive load three times during the study, single items measuring mental effort (Paas, 1992) and perceived difficulty (Kalyuga et al., 1999), respectively, were used.

In the first experiment, 283 seventh and eighth graders from German secondary schools (46.6% female; M = 13.48 years, SD = 0.67), and in the second experiment, 181 seventh and eighth graders (54.4% female; M = 13.08 years, SD = 0.71) learned the chemical processes of washing laundry with a computer based learning environment.

Results revealed that the multimedia principle was met for this kind of instructional material. Moreover, results on post knowledge and perceived difficulty showed consistently a significant superiority of animations over static pictures. However, there were no significant effects on mental effort. Concerning narrations, results are inconclusive in terms of post knowledge and mental effort. Contrary to our assumptions, the interaction of specific information in narrations with type of visualizations was not significant, neither in experiment 1 nor in experiment 2.

To sum up, it was hypothesized that the kind of textual information of an accompanying narration would moderate learning with animations and static pictures. In line with the redundancy principle, it was expected that the instructional superiority of animations over static pictures might be even more pronounced when the accompanying text does not contain redundant process information. The hypothesized interaction between the type of narration and the type of visualizations was not observable in our data, however. One reason could be that the process was quite easy to understand, so that the visualization was sufficient and the narration was redundant (or the other way around). However, participants rated perceived difficulty during learning and testing with a mean around 6 (on a scale between 1 and 9), implying a rather high difficulty. For future research, cognitive load theory is a promising background to generate a more sophisticated view on the interaction between visualizations and narrations, whereas this study could be seen as a starting point.