

Cognitive load in learning processes. Analysis of school textbooks

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The PhD dissertation analyses the properties of graphic educational materials that, according to the cognitive load theory (Sweller 2020), may be a source of external cognitive load responsible for a reduction in learning effectiveness. Given the scale of textbook use in public schools and their impact on the learning processes of millions of Polish students, we decided to subject them to qualitative research that aimed to isolate, explain, and estimate the sources of potential external cognitive load induced by visual aspects of early childhood education textbooks. First grade students in particular, who do not yet have fully developed cognitive processes and elaborate cognitive structures, are exposed to this type of cognitive load, so the focus here is on early childhood education textbooks for grade one.

The first chapter of the theoretical part discusses issues related to learning with understanding such as the course of the cognitive process, cognitive structures and cognitive load occurring during learning. It also considers the specifics of working memory and attention of children in early school age. The second chapter presents two key concepts for the study: cognitive load theory (Sweller 2020) and cognitive theory of multimedia learning (Mayer 2017) as well as four recommendations formulated by these theories adopted for the study. The recommendations refer to the visual aspects of learning materials, i.e.: maintaining spatial coherence, avoiding redundancy, maintaining coherence, using signaling. The last theoretical chapter was devoted to school textbooks and issues related to textbook graphics, i.e. illustration, typography, and composition (layout). The fourth chapter presents the methodological basis of the author's research; it defines the aims, object and problem questions and discusses the research strategy and methods adopted. The last chapter contains analyses of the visual layer of textbooks, which were conducted in relation to the selected four recommendations formulated within the framework of the adopted cognitive learning theories.

The indicated recommendations were used to formulate several criteria for qualitative analysis. The study included a visual insert of the most popular Polish paper textbooks intended for students of the first grade of elementary school and one e-book for the same age group.

The analyses revealed that the textbooks are generally at a good and average level, but in each of them graphic solutions were found which, according to the theories presented, may be a source of external cognitive load. In the analyzed textbooks there are, among other things, deficiencies in the clarity of the structure of the composition and proper navigation, too many graphic elements, including an engaging background, and the graphical inconsistency of the visual material is also noticeable. A major shortcoming of the analyzed content is the failure to fully use the potential of signaling and integrated sources of information consisting of images and text, such as infographics.