Spatial Thinking and the College Curriculum

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Visual forms of learning are crucial in many disciplines across the college curriculum. Our research shows that approximately half the space in science textbooks is allocated to visual and spatial representations such as diagrams, figures, photos, and tables. In addition, graphics (including animations, video, charts, photos, and illustrations) are heavily used in classroom instruction, often within the context of slide shows.

For the past 20 years, my colleagues and I have been investigating the most effective ways to present graphics and words to promote learner understanding. One of our earliest findings was that college students learn more deeply from a lesson that contains words (e.g., printed or spoken text) and graphics (e.g., illustrations or animation) than from words alone. However, not all graphics are equally effective in explaining material to students. We have conducted more than 100 experimental comparisons involving ways of presenting words and graphics to learners. This work allows us to generate a set of research-based principles of instructional design for multimedia learning—that is, learning from words and graphics. These principles are summarized in Multimedia Learning: Second Edition, and have relevance for improving instruction involving graphics across the college curriculum. I am particularly interested in how to design textbook lessons, slideshow presentations, and computer-based lessons using graphics and words that promote deep learning in college students.

Although we expect students to be able to learn with pictorial representations, we rarely teach them how to do so. Unlike mathematical and verbal skills, which are the focus of extensive explicit instruction in education, spatial skills often form part of the hidden curriculum—content that students are expected to learn without instruction. To address this issue, my colleagues and I have been investigating teaching of learning strategies for processing graphics and text. Students who do not develop effective strategies for processing graphics may need direct instruction in comprehension of graphics, analogous to widely implemented instruction in strategies for reading comprehension that focus on processing of words. I am interested in promoting this 21st century skill of how to mentally represent graphics and use them in spatial thinking.