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# The Mechanisms by Which Smaller Images Provide Beneficial Effects in Category Learning

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# The Mechanisms by Which Smaller Images Provide Beneficial Effects in Category Learning

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Identifying conditions that enhance category learning presents an opportunity for improving science education (e.g., teaching rock categories in geology courses). However, research on this topic is relatively scarce. Past research in our laboratory has suggested that presenting some natural categories, such as tropical fish, as small (100 px) rather than large (1000 px) images is beneficial for learning. The current research is aimed at uncovering the mechanism of this effect. We identified three plausible mechanisms supporting the advantages that smaller images provide for the learner and present several experiments assessing the merit of these hypotheses. *The general desirable difficulty hypothesis* suggests that small images create difficulty in the learning process, which subsequently improves performance. *The attention shift hypothesis* suggests that leaners' attention shifts from the color/pattern of the body to the outside shape (a critical feature for determining the fish category) as the image becomes smaller, a prediction based on a mathematical relationship between perimeter and area of an object. *The ease of shape extraction hypothesis* proposes that shapes are easier to extract for small images because the entire shape is within leaners' visual contour, whereas larger images are not and thus requires gaze shifting during the shape extraction process. Our data is evidence against the *attentional shift hypothesis*. The other two hypotheses remain plausible, although the general pattern of results seem to favor *the general desirable difficulty hypothesis*. Participants made Category Learning Judgments (CLJs) to predict expected success of tropical fish category classification when presented with new images. Across all experiments, we predicted and observed that participants judged that larger pictures aided their learning the most—the opposite of their actual performance.