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Children's Reasoning about Geometric Footprints

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Abstract: We explored preschool's children's understanding of the correspondence of 3-D objects and 2-D faces in a novel task. In the "footprints" task children were shown a geometric solid, such as a pyramid or a prism, and asked to select which shape the solid would make if it were dipped in ink and stamped on a piece of paper. Through a latent class analysis of children's errors we found children differed significantly in their misconceptions about object structure. Three distinct classes of children emerged: children who could only match visible faces, children who believed solids have an 'essential' face irrespective of rotation, and children who differentiated faces based on a solid's rotation. We examined the characteristics of children in each of these classes using a battery of spatial tasks and numeric tasks. Our results suggest errors found in older children's and adults' reasoning about geometric concepts develop prior to formal schooling.