

The impact of cognitive style, spatial ability, and spatial cognitive preference on 3D design self-efficacy in 3D design

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Abstract

This study explores the influence of cognitive style, spatial ability, and spatial cognitive preference on self-efficacy in the context of 3D design, specifically within a university course focused on 3D scene design. The research employed various assessment tools including the Group Embedded Figures Test and spatial ability assessment, as well as the Object-Spatial Imagery and Verbal Questionnaire, 3D Design Self-Efficacy Scale, and 3D design performance. The results indicate a generally positive attitude towards self-efficacy in 3D design among students, with higher self-efficacy associated with better performance ($p = .028 < 0.05$). Students with a field-independent cognitive style exhibited stronger spatial ability ($\beta = .385, t = 4.240, p < .001$), and higher spatial ability was correlated with a greater spatial cognitive preference ($\beta = .431, t = 4.547, p < .001$). Students who tend to spatial cognitive preference also demonstrated higher self-efficacy in 3D design ($\beta = .502, t = 7.270, p < .001$). Interestingly, students with a field-dependent cognitive style also showed elevated levels of self-efficacy in this 3D design ($\beta = -.221, t = 1.972, p < .05$). Overall, these findings highlight the significance of cognitive style, spatial ability, and spatial cognitive preference in shaping self-efficacy in the field of 3D design, contributing to the validation of a comprehensive model for understanding self-efficacy in this domain.

Keywords: Cognitive style, Spatial ability, Spatial cognitive preference, 3D Design Self-Efficacy, 3D design