

THE BRAIN AND LEARNING: EXAMINING THE CONNECTION BETWEEN
BRAIN ACTIVITY, SPATIAL INTELLIGENCE, AND LEARNING OUTCOMES IN
ONLINE VISUAL INSTRUCTION (113 pp.)

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The purpose of the study was to compare 2D and 3D visual presentation styles, both still frame and animation, on subjects' brain activity measured by the amplitude of EEG alpha wave and on their recall to see if alpha power and recall differ significantly by depth and movement of visual presentation style and by spatial intelligence. In addition, the study sought to determine whether there is any significant interaction between spatial intelligence and visual presentation style on alpha power and recall, and to determine whether any relationship exists between alpha power and recall.

The subjects in the present study were one hundred and twenty three undergraduate students at a university in the Midwest. After taking Vandenberg & Kuse's Mental Rotations Test, subjects were divided into low and high spatial intelligence groups, and subjects in each spatial intelligence group were evenly assigned to four different types of visual presentation style (2D still frame, 2D animation, 3D still frame, and 3D animation), receiving an instruction on LASIK eye surgical procedure in its respective visual presentation style. During the one-minute visual instruction, subjects' brain activity was measured and recorded using a wireless EEG headset. Upon completion of the instruction, subjects were given a 10-item multiple-choice test to measure their recall of the material presented during the instruction.

Two 2 (spatial intelligence) x 2 (depth) x 2 (movement) factorial Analysis of Variance (ANOVA) were conducted, one with alpha power as a dependent variable and the other with recall as a dependent variable, to determine whether there is a significant difference in alpha power and recall by spatial intelligence and visual presentation style, as well as whether there is an interaction between these variables that affects alpha power and recall. The Pearson Correlation Coefficient was calculated to examine relationship between alpha power and recall.

The present study found (a) EEG alpha power did not differ by the difference in depth and movement, (b) 2D and animation were found to be more effective on recall, (c) alpha power did not differ by spatial intelligence, (d) recall did not differ by spatial intelligence, (e) there was a significant interaction between spatial intelligence and movement that affected alpha power; still frame resulted in higher alpha power for low spatial learners, and animation resulted in higher alpha power for high spatial learners, (f) there was a significant interaction between spatial intelligence, depth and movement on recall; for low spatial learners, 2D animation resulted in significantly higher recall than both 2D still frame and 3D animation, and for high spatial learners, 3D animation resulted in significantly higher recall than 3D still frame, and both 2D still frame and 2D animation resulted in close to significantly higher recall than 3D still frame, and (g) there was a mildly inverse relationship between alpha power and recall, brought on by a strong inverse relationship in 2D still frame revealing a 'higher alpha power-lower recall connection' for low spatial learners and a 'lower alpha power-higher recall connection' for high spatial learners.