

We examined the accuracy of mental rotation and spatial recall within an augmented reality sandbox to study the effects of two-dimensional and three-dimensional learning. The goal of the study was to gain feedback about the ability to use an augmented reality sandbox for learning spatial relationships and testing spatial memory. Using Piaget's Three Mountain Task (Robinson & Robinson, 1983) as a basis for our study, at encoding participants were shown either a two-dimensional image of a landscape or a three-dimensional landscape created in the sandbox, both the same scale (2x3 feet). Participants were given 30 seconds to commit the landscape to memory. Participants then engaged in a distractor task for 3 minutes to clear their short-term memory. Participants were then asked to recreate the landscape that was provided but from a rotated point of view. We found that correctly created scenes from three-dimensional encoding recreations ( $M=4.50$   $SD=1.27$ ) contain more accurately placed features than the two-dimensional recall ( $M=2.42$   $SD=.90$ ),  $t(20)=4.50$ ,  $p<.01$ ,  $d=1.92$ . We concluded that augmented reality sandboxes could enhance long-term memories. The application of augmented reality technology of this nature could drive learning within an educational setting, military planning, or memory training programs. We hope to expand on our study in the future to include children to further test the development of memory and create educational activities.