# Assessing Spatial Design in Virtual Environments

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## EXECUTIVE SUMMARY

*There is growing interest in adopting three-dimensional virtual environments within spatial design courses to use digital modelling techniques to support students' learning. One pedagogical issue that has received little attention so far is the question of how 3D virtual environments can be used to implement assessment techniques that support students' learning of spatial design expertise. This chapter seeks to assist spatial design educators who are considering digital modelling by presenting two case studies that highlight assessment practices within spatial design courses using virtual environments. Rubrics and student work samples are included. These courses both involve students creating architectural designs within virtual environments, yet contrast in several ways: learning outcomes, 3D modelling technologies, and student cohorts. The cases examine how the affordances of virtual environments for iterative, immersive, and collaborative design can enable formative and summative assessment, with both design process and the final artefact playing important roles.*

## BACKGROUND

Digital modelling technologies have been integrated into undergraduate fine art, spatial design and architectural courses for many years to provide learners with a virtual design space for prototyping concept ideas. In recent years the accessibility and ease of use of contemporary virtual environments has seen adoption of these technologies increasing from small elective classes in third and fourth year (Pickersgill, 2007; More & Burrow, 2007) to larger first year courses of 100 students or more (Lowe, 2008, 2009, 2012; McMeel & Cockeram, 2011; Pelosi, 2010). In an associated trend a small but increasing number of primary and secondary students are completing design projects in virtual environments (Cram, Hedberg, Lumkin, & Eade, 2010; D'Souza, Yoon, & Islam, 2010; Twining & Footring, 2008).

As adoption of digital modelling grows, questions concerning learning design gain prominence, drawing the focus toward how to best set up the challenges to enhance students' learning. This chapter argues that questions concerning assessment are critical to enhancing learning and presents two case studies that illuminate the assessment techniques for spatial design that are afforded by virtual environments. An 'assessment for learning' perspective is assumed, which focuses on "any assessment for which the first priority in its design and practice is to serve the purpose of promoting students' learning" (Black, Harrison, Lee, Marshall, & Wiliam, 2004, p. 10). Within this perspective, assessment and learning are coupled rather than sequential processes, with formative assessment playing an important role in guiding students' learning trajectories. Shepard summarises the following characteristics of assessment for learning: "challenging tasks to elicit higher order thinking; addresses learning processes as well as learning outcomes; an on-going process, integrated with instruction; used formatively in support of student learning; expectations visible to students; students active in evaluating their own work; used to evaluate teaching as well as student learning." (Shepard, 2000, p. 8). This places emphasis on supporting the students to construct their own interpretations and practices. Further to this, Nicol & Macfarlane-Dick (2006) argue that students are supported most effectively when the feedback available to them clarifies the goals, criteria and expected standards for student efforts, provides high quality information that identifies student progress, and provides opportunities for the student to close the gap between current and desired expertise. Three-dimensional virtual environments offer a design space that potentially promotes an assessment for learning approach, allowing students to respond to ill-structured design challenges through an iterative and experiential design process, and through this develop richer understandings of spatial design.

This chapter seeks to inform the development of future spatial design courses by presenting detailed case studies that reveal how virtual environments facilitate assessment in spatial design education. Two architecture courses that implemented

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