Category: Presentation

The 10 Cube Challenge: Using Virtual Worlds to Foster Creative Thinking

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Abstract:

3D virtual worlds foster creativity through the development of a creativity skill set, as identified by E. Paul Torrance. Using a blended learning approach, which leverages both face-to-face and computer-mediated interactions, high school students participated in scaffolded curricular inquiry-based activities that introduced basic mathematic principals to working in 3D environments, while deliberately providing students with an opportunity to develop creative thinking. Entitled the 10 cube challenge, students were required to develop a model using exactly 10 cube, or cubid shaped, primitive objects to replicate the shape of a real world object.
**One Sentence Summary:** The 10 cube challenge, a 3D virtual world activity, engaged students to utilize mathematical principals while developing creative thinking.

**Main Text:**

**Introduction**

We are currently witnessing immense growth in the application of digital media in education. With many opportunities to integrate new technology we find ourselves regularly needing to revisit how we deliver instruction, and what new potential is on offer. Research suggests that participating online, for many students, can be less intimidating than traditional classroom environments, leading to increased student interaction [1] Evidence demonstrates that projects integrated into teaching models that utilize online tools increase engagement, achievement [2, 3, 4] and self-directed learning [5, 6].

The challenge with utilizing an online medium, therefore, is to develop domain-specific knowledge while simultaneously developing 21st century skills. The concept of 21st century skills has long suffered from the misconception of being able to use a computer. 21st century skill development – college and career readiness skills that transcend specific content knowledge – include: information literacy, work ethic, communication, problem solving, innovation/creativity, and responsible citizenship.

Of particular interest is the development of creativity. In many countries, creativity is not considered a transient fad, but something that has an explicit role in the growth of a nation’s economy [7]. The Partnership for 21st Century Skills identified creativity as an essential skill for the future workforce. Daniel Pink [8] argues that creativity “is at a premium in a world where specialized knowledge work can quickly become routinized work – and therefore be automated or outsourced away” (p. 135).

Howard Gardner proposed the Creative Mind as part of his five minds for the future. He argued that societies who value creativity will seek to nurture its development, and those that eventually learn how to cultivate creativity are more likely to thrive [9]. Efforts to foster creativity require the support of teachers and individuals who can structure a flexible and safe educational environment [10]. Unfortunately, these efforts are often overshadowed by other demands placed on educators that have been largely propelled in recent years by the No Child Left Behind Act of 2001. “Assessments of student learning, particularly those which are externally mandated, have taken center stage in America’s classrooms” [11, p. 254].

**Virtual Worlds Leverage both Math Knowledge and Creativity Skills**

Our Center for 21st Century Skills at EDUCATION CONNECTION team has developed a 3D virtual world, the International Virtual Collaboration Space II (IVCS2), created in the open-source solution, OpenSimulator (opensimulator.org). It has given us a unique opportunity to explore how creative potential can be better developed in high school students. Students from seven diverse high schools currently piloting a 9th-grade technology and digital literacy foundational course, Skills21, participated in the project. The class is designed to introduce students to a wide variety of digital technologies including digital storytelling, information literacy, 3D animation, and digital design, all of which can be utilized across a four-year Academy science and technology sequence. Using the technology, the Skills21 class challenged
students to apply skills identified as essential to success in the 21st Century with a focus toward fostering creative thinking.

To respond to the challenge of fostering the 21st century skill of creativity in conjunction with domain specific mathematics content knowledge, we developed a 10 cube challenge activity for IVCS2. It was designed with an objective to introducing students to geometric concepts necessary for working in a 3D environment, but also include the integration of specific skills associated with creativity, as documented in research by E. Paul Torrance, who identified a ‘Creativity Skill Set,’ which include being original, identifying what is most important and absolutely essential, and resisting the temptation to complete the task in the easiest and quickest way – that could be used to direct the teaching and training of creativity more effectively [12]. In this particular activity, individual students are challenged to create a model that replicates the form of a real-world object using exactly 10 cube, or cuboid shaped primitives. The creativity skill applied in the assignment was:

**Be Original:** moving away from the obvious; breaking away from habit bound thinking; the ability to creative novel, different or unusual ideas.

The 10 Cube Challenge arena, a virtual exhibition space created for students to showcase their work, initially included wardrobes, chairs, stairs, and single cubes scattered in 3D space (see Figure 1). While these examples met the criteria of the assignment and demonstrated an understanding of working in 3D space, they failed to meet the creativity objective.

![Figure 1. Samples of initial student work for the 10 cube challenge](image)

As time progressed however, certain individuals began to move away from the obvious and explore originality. As student models were on public display, it appeared to encourage the development of more creative works, with some students abandoning their first creation, and replacing it with another. One challenge that illustrates the challenge of the creative process intersecting with mathematical understanding is demonstrated in Figure 2. The student created a cat, thinking in two dimensions. From a head-on perspective, the rendering appears correct. However, when working in a 3D environment, the coordinate system goes beyond XY to XYZ for the third dimension. The figure demonstrates that the task was completed incorrectly when
viewed in the 3D perspective. This intersection maps the importance of creativity skill with math knowledge.

Figure 2. 10 cube challenge example of “the cat” from the 2D perspective and the 3D perspective

The conclusion of the assignment was a genuine result to break-habit bound thinking and achieve originality. Twelve models were selected and moved to an empty space on the island. These models included, but not limited to, a swing, a medieval guillotine, a piano, a giraffe, a Tie Fighter, and even a model of Indiana Jones running from a huge boulder (see Figure 2). Students were encouraged to evaluate the work on display based on four simple questions that related to the assignment and the previously referenced creativity skill set, (1) Which model did they feel was the most original based on their expectations for the challenge? (2) Which model did they feel best represented the shape of the real world object it was replicating? (3) Which model was an inspiration to others attempting the 10 Cube Challenge?, and finally students were asked to consider (4) Which model had the ‘X Factor’. These questions highlighted originality, but also considered the value they provided within assignment, both of which are considered the main component in the common definition for creativity [13].

Figure 2. Showcased exemplars for the 10 cube challenge

**Implications**

While there is promising indicators that demonstrate a deliberate attempt to foster creativity has been successful, it certainly appears that creativity has been better appreciated. Through descriptive evidence, teachers have explicitly taken time to define creativity in their classrooms and develop rubrics that are designed to measure creative products that were created in the 3D virtual world.
Well-designed 3D virtual world activities, like the 10 cube challenge, are inquiry and discovery-based. They balance a unique learning platform that provides a natural environment that fosters creativity, while aligned to standards. They force students and teachers outside their comfort zone. Inherently, problems arise that demand creative thinking in order to develop a solution. A 3D virtual world platform allows students to develop knowledge, skills, and dispositions of the self-directed autonomous learner. Teachers can facilitate the gradual release of responsibility as they transfer ownership of the virtual world to their students for the unique development of the real estate. This is a world filled with ill-defined problems [14], which is essential to the development of creative thinking [9].

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