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iSee: Teaching Visual Learning in an Organic Virtual Learning Environment

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Abstract

This paper presents a three-year participatory action research project focusing on the graduate level course entitled Visual Learning in 3D Animated Virtual Worlds. The purpose of this research was to understand *How the virtual world processes of observing and creating can best help students learn visual theories.* The first cycle of this research revealed that hands-on virtual world experiences do help students perceive the real world environment and learn visual theories. The second cycle of the research showed that a teacher-free learning environment was well perceived by students. The third cycle of the research showed that the intensive course did not allow students to have time to reflect or form the deeper understanding necessary for making connections between theory and practice. Therefore, this research suggests that the best way to help students learn visual theories is through creating a teacher-free visual learning environment within the span of a regular course.

Background

Due in large part to the influence of advanced technology, imagery plays a very important role in our lives today. Students are not just image consumers, but they are also image creators (Bruns, 2008). The snapshots they share, the images they "photoshop," and even the customized avatars they create in computer games all become part of today's visual culture (Duncum, 2015; Karpati, Freedman, Castro, Kallio-Tavin, & Heijnen, 2016).

For many students of art and design, an essential, required course is the teaching of visual learning theories. However, in my previous experience,[1] students who were able to write a comprehensive paper at the end of the course often were still not able to apply in practice what they had learned in theory. It is this observation that inspired the initial goal of this research: to see if hands-on experiences could enhance student learning of the theories taught and discussed in class.

There were a few considerations that led me to choose an organic virtual world[2] as the hands-on practice media for this research. First, the research participants were teachers from different educational fields and many did not have a professional art background. In the organic virtual world, all users can create, modify, or reuse virtual objects without the need to build from scratch. Secondly, the organic virtual world is a three-dimensional environment in which users are required to see the world from multiple perspectives. Finally, since the virtual world is organic, users can come back to their virtual environment to add, modify, delete, or recreate the environment as needed to create a better end result. This flexibility in art making and lesson design were the reasons I chose organic virtual worlds for this research.

Literature Review

Today, organic virtual worlds provide another habitat in which young people can live, play, create, and learn. Many educators use virtual worlds such as Second Life, Minecraft, and OpenSim to engage learning (Taylor, & Carpenter, 2005; Overby & Jones, 2015; Baker, Wentz, & Woods, 2009; Collins, Bently & Conto, 2008; Short, 2012; Han, 2015a, 2015b). The use of organic virtual worlds as learning environments is no longer considered innovative in education (Dickey, 2005b; Gualdron, 2012; Luke, 2006; Russell, 2006); however, the importance of learning through the visual in the virtual world has not yet been emphasized.

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[1] I taught an undergraduate visual psychology course in a visual communication and design department in year 2011-2012.

[2] Virtual world in this paper is defined as an online environment in which users are able to modify their avatars and construct the world they inhabit. Currently the most well know virtual worlds include Minecraft, Second Life, and Open Simulator.

For my examination of this topic, I have divided the literature review into two sections, virtual and visual, to emphasize the aspects of each that are most important to this research.

Virtual

With the improvement of technology, many educators are using advanced technology for teaching different subject areas (Kumpulainen, Mikkola, & Jaatinen, 2014; Wang, Chen, & Lin, 2014; Yang, 2014; Beckman, Bennett, & Lockyer, 2014; Owen-Jackson, 2015; Kay, 2014). The organic virtual world is one of the most popular advanced technologies currently used in education (Abbattista, Calefato, De Lucia, Francese, Lanubile, Passero, 2009; Burbules, 2006; Chen, Slau, & Nah, 2008; Dickey, 2005b, 2005b; Han, 2013; Han, 2011).

Virtual worlds are the natural extension of 2D technologies (Traub, 1994); residents can interact with other residents as they do in the real world. Organic virtual worlds are online communities in which residents can share their beliefs, create new inventions, and generate new ideas (Metros, 1999). As Home states, "Realities by which we see existence are not really reality but an intellectual creation" (as cited in Anyanwu, 1998). In the organic virtual worlds of Second Life, Active World, and Open Sim, residents can create their own 3D avatars, build their own visual environments, and control their own visual virtual movement (Manovich, 2001). The border of the real world and the virtual world is defined by the "production, reproduction and imagination" of virtual world users (p. 120). Because of the huge influence of the virtual world, many scholars (Duncum, 1999; Geoffrey, 1994; Mitchell, 2005; Sturken, & Cartwright, 2004; Woolley, 1992) have started to consider what is real and what is virtual. As Lemke (1993) states, the virtual world reminds us that we are not "just organisms, we are organisms constituted by our interactions with our environments, and increasingly those environments are artificial" (p. 13).

When virtual worlds are reconceived as an educational concept, virtual worlds become not just the delivery system but also the learning spaces. This shift stands in stark contrast to much of current practice by highlighting choice, decision-making, and exploration as central aspects of learning (Burbules, 2006). Languages, international business, science, math, and art are all taught in virtual worlds (Abbattista, Calefato, De Lucia, Francese, Lanubile, Passero, 2009; Burbules, 2006; Chen, Slau, & Nah, 2008; Dickey, 2005b, 2005b; Lu, 2013). Learning activities in the virtual world allow students to interact with information from a first person perspective (Dickey, 2005b). However, as Lindlif and Shatzer (1998) state, "Meanings are embodied in practice" (Taylor & Carpenter, 2005, p. 1). When compared with learning activities that use a minds-on approach, hands-on activities allow learners to uncover more layers of meaning from their conscious doing (Dewey, 2005). As Traub (1994) states, behavioral change is caused by interactions in which external events support internal learning processes within specifically defined environments.

Developing an organic virtual world for education requires instructors to have a well-planned curriculum, an interactive pedagogy, and the creative vision to bring their designs to life (Han, Yaro, Gillard, Haugh, Ihnatovych, & Liu, 2014). In organic virtual learning environments, educators can incorporate several kinds of software, games and puzzles from different sources into their world, and can invite students to explore these activities and have fun while they learn. Learning can be relaxing and joyful (Han, Zhang, Peikazadi, Shi, Hung, Doan, & Filippelli, 2016).

Visual

Human beings not only perceive what they see, they also build their own ideas and knowledge about what they are seeing. People become used to the images they see in their daily lives and learn from these images (Dake, 1999; Freedman, 2003). However, most of the time, people do not notice that these same images may hold different meanings for other viewers because they do not realize that their own understanding of these images has been formed by cultural conventions (Masalela, 2005). "Even our unconscious eye movements are detected by the search for information that will help to make sense of the stimulus based on our previous knowledge" (Freedman, 2003, p. 67). Moreover, the images people have unconsciously perceived, if viewed repeatedly, will be stored in their long-term memory and will influence how they perceive similar images in the future (Barry, 1997; Hoffmann, 2007; Kellogg, 1995). According to Hoffmann (2007), through visual experience, people learn the images repeated around them and people are able to manipulate the images they recreate. When people see two images that are combined together, but not related to each other, the meaning of the whole image will be different (Arnheim, 1970). Without consciously seeing the world as it is represented in images, people may not realize what they are learning or from where they are learning it.

Heidegger proposed that we are living in the "age of the world picture" (as cited in Mitchell, 2005, p. xv). In this era of technology, the whole world becomes images, and people learn everything about the world from images and pictures. From Mitchell's (2005) point of view, images do not just mirror the world, but are "ways of world making" (p. xv).

As Mirzoeff (2013) states, images are not innocent, and images are always propagating (Sturken, & Cartwright, 2004). Rogoff (2002) also states: "images convey information, afford pleasure and displeasure, influence style, determine consumption and mediate power relations" (p. 25). Therefore, if viewers are not conscious of their ways of seeing, they may not understand the full meaning of everything they see (Barry, 1997). In an organic virtual world, residents need to be consciously aware of how they use images to propagate their ideas to each other, and need to resist unconsciously adapting and accepting everything that is transferred through images.

The Internet creates a world community without physical boundaries. People may easily forget that this environment is shared with others who have different cultural backgrounds. "For communication to be meaningful, people need to do more than just link computers but need to construct and approach how other people in other cultures experience their world" (Masalela, 2005, p. 146).

Since people consciously or unconsciously learn from didactic images within environments, educators know the importance of visual representation in traditional school settings. In organic virtual worlds, everything is built by residents who have come from cultures around the world (Han, 2010). Virtual worlds residents are exposed to not only their own culture, but also many other cultural environments (Han, 2011). As Miller and Burton (1994) state, "reality is constructed from what we sense based on our experience, emotional condition, beliefs, and so forth" (p. 66); culture is a reality based on our experience. When people from different places around the world come together in a virtual world, everyone brings his or her own cultural background. Residents also create their own culture, influenced by personal ideals and imaginary visions.

Research Background and Method

This is a three-year participatory action research project based on a graduate level course, EDCP 585 – Seminar in Curriculum and Pedagogy: Visual Learning in 3D Animated Virtual Worlds. This course sought to help students critically analyze the visual environment in the virtual world and apply their virtual experience to the real world environment. In this course, each class was divided into two parts: theory discussion and practice. In the discussion section, students learned digital visual cultural theory which includes but is not limited to Cognitive psychology and visual learning (Efland, 2002; Mayer, 2005; Scoresby & Shelton, 2011), Visual culture in virtual worlds (Bogdanovych, Rodriguez, Simoff, & Cohen, 2009; Burn & Barnett, 1999; Cermin, 2012; Freedman & Stuhr, 2004; Jenkins & Thorburn, 2004; Messaris, 2012; Robins, 1999), Visual communication in virtual worlds (Burnett, 2005; Gunkel, 2000; Milgram, & Kishino, 1994; Semali, 2005; Zyda, 2005), Visual literacy in virtual worlds (Bazalgette, & Buckingham, 2013; Dickey, 2005a; Diehl & Prins, 2008; Masalela, 2005; Säljö, 2012), Semiotics in Second Life (Cook, 1998; de Souza, 2013; Han, 2011; Tettegah, Whang, Taylor & Cash, 2008), Media literacy and virtual pedagogy (Alvermann, & Hagood, 2000; Dickey, 2005c; Hobbs, 1998; Kellner, 1998; Kellner & Share, 2005; Stoerger, 2008), Ethics and Plagiarism (Good, 2004; Howe, 2006; Liapis, Yannakakis, & Togelius, 2012;), and Digital storytelling in virtual worlds (Negrini & Di Blas, 2015; Park, 2014; Shelby-Caffey, Úbéda, & Jenkins, 2014). In the practice section, students incorporated digital visual cultural theory to their design of a virtual learning space to deepen their understanding of virtual world pedagogy. Toward the end of the term, students experienced

teaching in their own virtual classroom through the virtual world pedagogy they developed and peer evaluate each other's virtual world creations based on the theories learned in class. Through this course, students learned how people learn through vision, how they can use visual learning skills to help their own students learn, and how to become more aware of what they are seeing and learning in the virtual world.

Methodology

This research was an empirical study, using the method of participatory action research. An empirical study is "any form of inquiry that depends upon the world of experience in some fundamental way" (Shank, 2006, p. 5). Action research is defined as "research undertaken by practitioners in order that they may improve their practices" (Corey, 1954, p. 375). In action research, improvement and involvement are central to the research (Robson, 2002). Researchers also agree that theory should be generated through practice (Brydon-Miller, Greenwood, & Maguire, 2003; Ozanne & Saatcioglu, 2008; Riel, 2010). Action research is composed of "planning, acting, observing, and evaluating" (McTaggart, 1991, p. 170), and should be flexible and responsive. As Reason and Bradbury have defined, action research is "a participatory, democratic process concerned with developing practical knowing in the pursuit of worthwhile human purposes, grounded in a participatory worldview which we believe is emerging at this historical moment" (as cited in Brydon-Miller, Greenwood, & Maguire, p. 2). Action research in education context is a means for teachers to "self-monitor," and to continue to learn from experience and become better teachers (Gore & Zeichner, 1991).

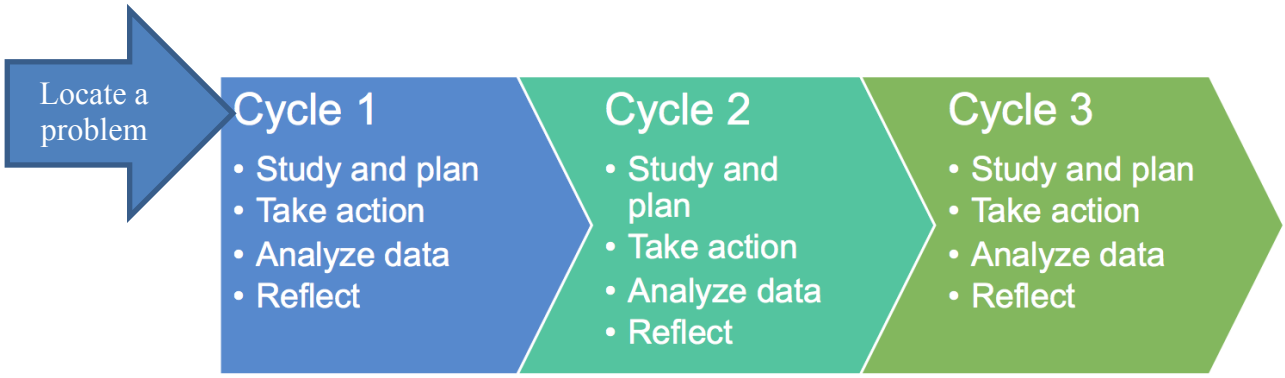

Figure 1. Process of action research (modified from The iterative process of action research by Riel, 2010)

For this participatory action research, I was the researcher as well as the instructor. The first cycle of this research was in a course with 9 students in the 2012 winter term. The second cycle of the research was in a course with 10 students in the 2013 winter term. The third cycle was in an intensive course with 5 students in the 2015 summer term. In the three-year span of

this research, most of the students were master's students and two were doctoral students. These students represented diverse subject areas, including: math, science, music, civics, language education, museum studies, and art education. Their cultural backgrounds were diverse as well; the students had come from Japan, Korea, China, Taiwan, Iran, Ukraine, Ghana, Belize, the United States, and Canada.

I used grounded theory with open coding to analyze my research data and "to generate a theory to explain what is central in the data" (Robson, 2002, p. 493). Open coding was used to interpret rather than summarize the data. The data I analyzed and reviewed were: field notes, reaction papers, final papers, recorded in-class discussions, and recorded teaching demonstrations of students as well as teacher's notes from me.

Research Questions

The main research question of this study was: How can virtual world experience best enhance student learning of visual theories? The sub-questions were: How does the experience of observation and the process of creation in the virtual world enhance student learning of visual theories? Can a teacher-free virtual learning environment best enhance student learning of visual theories? How do different time frames influence student learning of virtual world building and theory comprehension?

Research Findings

First Cycle: Virtual Learning Environment: Virtual World Experience Alters Users' Viewing Practices

The first cycle was also the very first time I taught this course. The research question was: How does the experience of observation and the process of creation in the virtual world enhance student learning of visual theories? My initial assumption came from personal experiences and other research on virtual worlds (Stokrocki, 2014; Shin, 2014). These experiences suggested that virtual world building helped users view the world differently. The findings of the first cycle confirmed that while learning, discussing, and thinking about visual theories, and when students were traveling in a virtual world, they employed the theories that they had learned (Han, 2015b).

Students pointed out that they thought about the purposes of the images (Burnett, 2005; Masalela, 2005), the meaning of the images (Semali, 2005), why the image creators created the images (Dickey, 2005c), what the images were intended to communicate to viewers (Han, 2011), the hidden meanings that can be found in images (Kellner& Share, 2005), and what might be implied through the images during the processes of traveling and building in the virtual world (Cook, 1998). Moreover, they literally saw things from different perspectives

because the virtual world is a 3D environment. They realized the importance and purpose of each image in the virtual environment they created. When building their virtual learning environments, they were not only thinking about visual learning theory, they were applying the theory to their virtual environments (Han, Yaro, Gillard, Haugh, Ihnatovych, & Liu, 2014).

They observed that a simple virtual learning environment, which provides information appropriate to the course content, may be more conducive to learning than a large and visually distracting environment. They also noticed the importance of the visual signage and interactivity in a virtual learning environment (Han, 2015b).

Findings for Next Cycle

Figure 2. A virtual world created by one student from the first cycle.

Because mastery of 3D software was not the goal of this course, it was important to allow the students to re-use, re-cycle, and modify existing objects in the virtual world. It was also important to start with virtual object modification instead of building 3D objects from scratch. This reduced student fears about virtual world creation, increased their confidence and interest in the creation process, and allowed them to spend more time and energy focusing on the design and redesign of the virtual learning environment.

The idea for the teacher-free environment was inspired by one student's question after spending much time and energy building in the virtual world: What will the world be when we (teachers) are not around? This is a common fact in most virtual learning environments. Many virtual learning environments, even those created by professional online learning specialists, cannot be used by students when instructors are not present. Therefore, the focus

of the second cycle was the design of teacher-free learning environments. And the research question became: Will teacher-free virtual learning environments best enhance student learning of visual theories?

Second Cycle: Creating Reacher-free Virtual Learning Environments: A Learning Environment Where Students Can Learn by Themselves

In the second cycle, I followed the same pattern for discussing visual learning theories as I did in the first cycle, but I added one lesson focusing on gaming theory and pedagogy (Han, 2015a; Roussou, 2004; Barab, Gresalfi, & Ingram-Goble, 2010) and I introduced the creation of the virtual world with object modifications. The students' reactions changed. First, most of the students had little to no gaming experience. Even when I explained that the popular massive multiplayer online role play games (MMORPG) were only one kind of game and other game categories include, but are not limited to, card games, board games, puzzle games, role playing games, racing games, shooting games, and sports games, (Han, 2015a), students struggled with applying their previous gaming experience to the design of a teacher-free learning environment.

Once the course introduced the creation of a virtual world with object modification, the students were relieved. This relaxed mental state encouraged the students to try building objects from scratch by themselves. The students who chose the more ambitious object creation were not only those with art education backgrounds; instead, all the students in the class tried building original objects.

Findings for Next Cycle

Figure 3. A virtual world created by one student from the second cycle

Many students adopted the model of a teacher-free learning environment. Although it was a game-like environment, it included clear visual signage. This clear visual signage allowed students traveling in the virtual environment to know where to go and what to do (Han, Zhang, Peikazadi, Shi, Hung, Doan, & Filippelli, 2016). In response to this, one student observed that a storytelling environment might be easier to start with than a gaming environment.

Students in the first and second cycle experienced difficulties with becoming accustomed to the processes of virtual world navigation and creation. Moreover, many students suggested at the beginning of the course that they hoped they would be working in groups because they were concerned about how much they might need to learn by themselves. To address this concern, I envisioned an intensive course with group work that could help students experience visual learning theories and have more virtual world involvement within a short time. I decided to teach this course in an intensive summer schedule in the third cycle. Students would work in groups and be able to decide what kind of virtual learning environment, teacher-free or teacher-lead, they would like to design. The research question for the third cycle became: How do different time frames influence student learning of virtual world building and theory comprehension?

Third Cycle: Creating Teacher Free Virtual Learning Environments in an Intensive Course Context

Since the third cycle was an intensive course, with classes meeting twice a week for six weeks, student learning progressed differently from the previous cycles. As students were learning the processes of virtual world navigation and creation, their new knowledge was reinforced in each class session, before it could be forgotten. It was the easiest virtual world course I have ever taught in higher education. However, learning the combination of theory and practice, in the intensive time frame, prevented students from having time to deeply reflect on the theory. Because they were not able to reflect, they were not able to design meaningful virtual learning environments. Most of the groups decided to create a teacher-lead environment, many of which were simply recreations of a real world classroom. These students were not able to experience the unique benefits of teaching in the virtual world because they designed activities that could also happen in a real world classroom.

As suggested in the second cycle, the students in the third cycle worked in groups. There are advantages and limitations to group work. Most students enjoyed the group work process, were able to discuss with each other how to design the overall learning environment, and were able to balance out their individual strengths and weaknesses by helping each other. Especially when the deadline was approaching, they helped each other complete the project.

At the same time, some students felt that they did not want to do the task they were assigned within their group or did not agree with the overall design for their learning environment. However, because they were working in groups, they had limited influence over the direction of the project. This lack of control caused some students to be less involved in the creation process, and convinced me to avoid this approach in the future.

Discussions and Future Research Suggestions

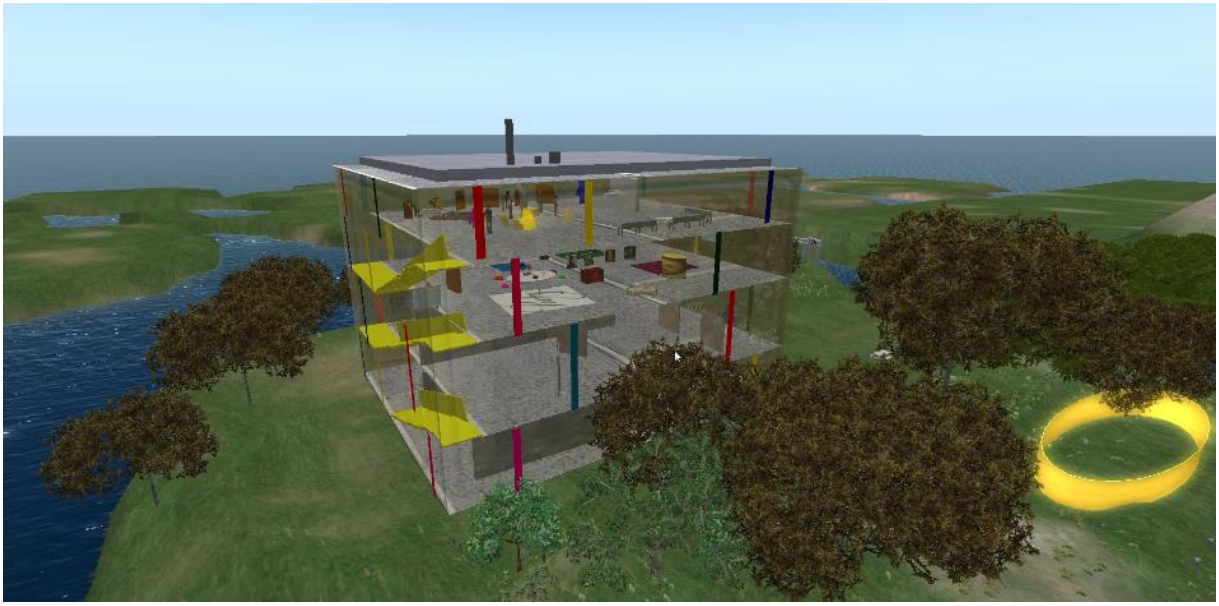

Figure 4. A virtual world created by a group of three students from the third cycle

The main research question is: How can virtual world experience best enhance student learning of visual theory? As the research findings showed, the benefit of using virtual worlds for teaching visual learning theory cannot be underestimated. Experience in virtual worlds encourages students to ask deeper questions and apply visual learning theory in their daily lives. Virtual worlds can help students to really open their eyes to see the world (Han, 2015b). Through their virtual world experiences, students found that a simple virtual learning environment providing appropriate information with clear visual signage was the best design for student learning. Both cycles 2 and 3 show that, when students are taught object modification without the intimidation of building objects from scratch, they are more willing to create their own objects. Working as a group may reduce student tension in a learning environment; however, when this approach was used, student investment in the project dramatically decreased. It seems that the environment best able to help student engagement and reduce student tension would be one in which students work independently, but the whole class functions as a learning organism, helping each other during the creation process.

The research also showed that the intensive course did help students learn virtual world navigation and building, but the students in the intensive class did not have enough time to reflect and think deeply about visual learning theory. Therefore, teaching visual learning in virtual worlds within a short time frame is not recommended. However, if the instructional goal of a course is teaching 3D building or design in virtual worlds, an intensive time frame may be preferred.

The second cycle of this research suggested future research into the use of digital storytelling to create teacher-free virtual learning environments. This study also suggested research into the use of virtual worlds to teach younger students visual literacy. Younger students are digital natives, and so require less time to learn how to use virtual worlds (Han, 2016); given their students' ease of using the technology, teachers should be able to spend more time on teaching visual literacy. Younger students also may have had more gaming experience. So, when designing a virtual learning environment, they might be able to more easily incorporate gaming experience into their creation.

Conclusion

As Mitchell (2005) states, "an image is not a text to be read but a ventriloquist's dummy into which we project our own voice" (p. 140). The mission of art education today is not only to teach students techniques for art making, but also to teach students how to convey meanings and ideas through art.

Virtual worlds may not be the most convenient teaching instrument for professors or teachers today. However, the benefits and teaching outcomes are undeniable. Through this three-year research project, teaching and learning in virtual worlds has taught my students and myself: how to see (and to what extent), what kind of detail to create or re-create, and how to apply theory in both virtual and real worlds. This research suggests that one of the best ways to help students learn visual theory is through the creation of a teacher-free visual learning environment in the timespan of a regular course.

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