Learning Design Drawing Aided by Augmented Reality

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Abstract

Realistic hand drawing is still a valuable skill for the designer, and learning in an in-person drawing course was enhanced through the use of Augmented reality. Representational drawings of interior spaces were digitized and displayed in the building environment using AR tags. This let the students envision how a space course be represented in the same environment they were drawing. AR-based graphic instructions for the construction of perspective drawings were also developed and shared with students. Examples of student drawings are included in this writing along with placement in the represented spaces. The research question was whether the use of augmented reality could increase the drawing ability of beginning design students in creating two-dimensional drawings from three-dimensional space.

Introduction

Two of the latest technologies to enter the educational realm are Augmented Reality (AR) and Virtual Reality (VR). Both have received considerable media attention over the past few years. Differentiating the two is the level of immersion as well as the software and hardware needed to create various experiences.

Augmented reality was used for implementation as there were pragmatic advantages over virtual reality: The only hardware needed as a smart device, and most college students have smart phones (Roberts, Yaya, & Manolis, 2014). In 2018 the Pew Research Center found 94% of adults aged 18-29 owned a smartphone (Pew Research Center, 2018). Virtual Reality however, is supported by more expensive hardware including the HTC VIve or Oculus Rift technologies. Even the Google developed affordable headset made of cardboard needs additional equipment.

Augmented reality has made inroads into education through a number of applications. AR has been used to train surgeons and teachers have used AR to explore different environments within the classroom.

One use of augmented reality was to represent costly mechanical parts with projections of bearings and gears in different views of these objects. This reduced “the time, effort and monetary cost needed for developing various educational materials for teaching hand-drawn mechanical drawing” (Horii, & Miyajima, 2013, p. 255). This also helped develop students’ manual drawing ability and a three-dimensional sense of the drawn objects.

Augmented reality has been used to project objects into the physical space rather than viewed through the screen of smart device. This was a use of Spatial Augmented Reality, or SAR, an enhanced version of AR, which sought “to improve speed or ease [of] drawing by projecting photos, virtual construction lines and interactive 3D scenes” (Laviole, & Hachet, 2012, p. 175).

Use of augmented reality in this manner adds additional richness to education and. Helps to accommodate the different learning styles of students. This writing concentrates on a basic application of augmented reality in a beginning drawing course for students in apparel, graphic, or interior design.

Augmented reality and beginning drawing

A studio class was supplemented by the use of augmented reality. The course is a required drawing course for undergraduate students in interior, apparel and graphic design at the University of Minnesota. The focus of the course is the development of drawing skills for design thinking and representational drawing. Augmented reality has benefited drawing instruction in our courses. The course must serve as the basis for all graphic design students as it is the only drawing course required over the four-year program. Course enrollments average 20 students in each section of the course.

Initial drawing skills of students vary greatly in every section. Surprisingly, a large number of entering design students have little or no drawing experience or skill. For those who have difficulty with drawing, augmented
reality can be a way to improve their skills in short period of time. Similarly, it can also enhance the abilities of more skilled students. AR levels the playing field as the technology by focusing on the resulting idea as opposed to the manual skills necessary to execute the drawing.

One major project that has been a centerpiece of the course is a drawing of an interior space in the classroom building. This drawing is also a requirement for a subsequent mandatory portfolio review for all design students. The final drawing, rendered by hand in pencil on paper is a full value representation, with values ranging from black to white. It shows a significant expanse of three-dimensional space.

Figures. 1 & 2. Images located in building environment

The linear perspective drawings are created by students while sitting around the building in various spaces. Photographs are sometimes used to record the lighting in the spaces for a given time, but the development of drawing skills in situ is the primary goal.

In previous semesters, good examples of student work has been shown on a projection screen in the classroom. Augmented reality, however, allows the drawings to be seen in the environment where they were created. This lets students see how a space has been illustrated in the past and from the same viewpoint.

Zapworks is a vendor that offers an online service for augmented reality that is accessed through their mobile phone app. This was used to overlay digital images onto the actual space. Drawings by previous students could be seen in the actual spaces that are represented. It is an exhibition of pencil drawings allowing students to view the work of their peers, and how they represented spaces by using AR. See Figures 1 & 2.
The work could be viewed by students by downloading the free app for their type of phone. The identification symbols that accessed the digital images were posted in different parts of the building.

Drawing construction

Developing correct representation of perspective is an important early skill of learning to draw. Future development of augmented reality includes visual identification of structural components necessary for one-, two-, or three-point perspective rendering. This includes elements such as horizon lines, vanishing points, converging lines, station points, ground line, ground plane, picture plane, and center line of vision (Gill, 1974). Sighting techniques and angle gauges were also identified as possible future enhancements. These elements would allow students to see how drawings could be constructed by hand to create a realistic representation of space.

Exhibition

Students were able to "mount" an exhibition of their work while maintaining the safety of their original drawings; there was no need to print large representation quality copies of their work. Student work was illustrated and tagged throughout the spaces of the building for the public to view through augmented reality.

Results of the course will be compared with previous versions in terms of quality of work, student acceptance, and impacts on the learning process. Additional ways of applying augmented reality to the design curriculum will be explored.
Figure 4. Placard with AR code

Citations


