Welcome to Gallery 5: An Immersive Digital Art Experience

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Abstract

Unfortunately, many schools have suffered budget cuts, heeded employer and state demands for increased STEM education, and faced increased pressure to prepare the children in their care for high stakes standardized exams, making art as an academic discipline an afterthought. To help bridge this gap, the Crystal Bridges Museum of American Art, in Bentonville, Arkansas, partnered with Virtual Arkansas to author high-quality digital courses for public high school students in Arkansas. The course includes extensive use of Gallery 5, an immersive, 3D online experience in which students curated their own art collection. This paper provides qualitative analysis of a pilot study of one of the courses, Art Appreciation: The American Identity. Qualitative data was examined, considering themes that inductively emerged from data collected using interviews and a focus group. Finally, recommendations are presented that should lead to learning design improvements.

Introduction

The history of American art is rich and varied. However, because many schools have suffered budget cuts, heeded employer and state demands for increased STEM education (Williams, 2014), and faced increased pressure to prepare the children in their care for high stakes standardized exams, art as an academic discipline often becomes an afterthought. Beyond putting children behind in terms of digital literacy, digital art, and other professions, this lack of emphasis on the arts may limit student growth on the exams that states now prioritize. In fact, research in recent years has explored the relationship between art exposure in museums with improvements on standardized assessments (Bowen, Green & Kisida, 2014; Green, Kisida & Bowen, 2014). For example, Bowen, Greene, and Kisida (2014) showed that even brief exposure to art in the form of a half day tour resulted in a significant increase in student scores on a critical thinking assessment.

To bridge the gap in emphasis on the arts, some non-profit alternative educational institutions provide educational opportunities in art for public school students. One example is the Crystal Bridges Museum of American Art, in Bentonville, Arkansas, partnered with Virtual Arkansas. This partnership provides high-quality digital courses to public school students in Arkansas and has resulted in the course, Art Appreciation: The American Identity. In this course for 9th through 12th graders, students make connections among art, history, and identity; and they practice and apply the skill of curation to create two online exhibits: one about student individual identity and one about American identity. The experience of curating art in the creation of these two exhibits has been a highlight of the course for students.

The technical components of the art appreciation course include a carefully selected variety of American art images, thoughtfully authored multimedia learning objects, and interesting and compelling assessments hosted by Virtual Arkansas in an online Blackboard Learning Management System. Most uniquely, the course includes extensive use of Gallery 5 (Version 1), an immersive, 3D online experience in which students curated their own art collection. Using the game engine Unity3D (Version 5.6.6)*,* this virtual gallery application was created by staff and students from the Tesseract Studio for Game Design and Immersive Environments at the University of Arkansas. Gallery 5 is highlighted in the final course project, an opportunity for students to create an art exhibit of their own using the Gallery 5 digital art curation tool.

A pilot study of Art Appreciation: The American Identity was implemented with 38 students and consisted of two parts. First, the course was evaluated using a Quality Matters (QM)

rubric.[1] Second, a mixed methods study of student and instructor perceptions and attitudes was conducted through the use of surveys, interviews, focus groups, and observations. The qualitative data was examined, considering themes that inductively emerged from data collected using interviews and a focus group. While not part of the data discussed in this article, quantitative data was also collected as part of several student and instructor surveys, looking for trends in student and instructor opinion. Finally, the findings were merged to develop recommendations that should lead to learning design improvements. This paper focuses on the qualitative data collected regarding student and instructor perceptions and attitudes about the Gallery 5 immersive environment and its impact on art learning among students.

Theoretical Framework or Perspectives

The course design of the art appreciation course employed a direct instruction model of computer-based instruction (Kulik & Kulik, 1991), while the signature pedagogy used in the Gallery 5 immersive environment was informed by the theory of situated cognition, specifically the cognitive apprenticeship. Teaching grounded in a cognitive apprenticeship was meant to supplement the direct instruction taking place in the classroom by placing the learning in a rich context surrounded by what it is students are expected to know and do. In a cognitive apprenticeship, students learn from an expert where they observe, enact, and practice expert actions with help from the teacher (Brown, Collins & Duguid, 1989). In this case, an objective was for students to understand art in historical and physical contexts, especially situated within the practice of museum curation.

Situated cognition happens in a contextualized, real-world setting where the learner is directly interacting with other learners while understanding important content. This type of learning is crucial in the discipline of art education, as students need to grasp important principles but are often removed from the actual environment where they will apply these principles. Learner reflection while present in the authentic environment is also an important part of situated learning (Brown, Collins & Duguid, 1989). Learners gain knowledge and skills through practical, hands-on experience rather than in a classroom viewing a lecture or presentation. Being in an authentic setting allows learners to apply specific art content knowledge acquired in a traditional classroom environment. An important aspect of situated cognition is the cognitive apprenticeship, which assists learning by helping learners to acquire, develop, and use cognitive tools while participating in an authentic activity (Brown, Collins & Duguid,

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[1] Quality Matters was created by a small group of education faculty from the eMarylandOnline, Inc. (MOL) consortium. They created a rubric to help assess the quality of online courses.

1989). For example, through a cognitive apprenticeship learners in the visual arts might directly observe what happens in the creation of art, model the practice of their teacher, and identify and reflect on the ideas they learned, including addressing any related misconceptions. In addition, teachers using a cognitive apprenticeship model encourage the development of their learners by making tacit knowledge explicit, modeling effective strategies for completing tasks, providing scaffolded support when learners are practicing new tasks, and offering specific feedback for improvement (Collins, Brown, & Newman, 1989). The student in this context must observe how the teacher applies differing principles in order to then experiment with the same methods. Through the cognitive apprenticeship, the student must confront his or her beliefs about the role of the art curator, for example, in a specific context and decide how and when to apply the instruction.

In practice, students using the Gallery 5 immersive space gathered contextual information about specific artwork, artists, and historical periods. Each work of art included primary, secondary, and multimedia source materials such as essays and videos. Throughout the course, videos created by the Crystal Bridges staff also unpacked the curatorial and exhibition processes and served as a virtual component of the cognitive apprenticeship that the course aimed to support. These source materials informed the final project, a student-curated exhibition within an immersive three-dimensional rendering of one of the museum's galleries. Using Gallery 5, students created multiple gallery projects and shared them with fellow students and their teachers.

Methods

Qualitative methods included an open-ended pretest survey, a semi-structured interview, a focus group, and an open-ended posttest survey. A pretest survey was administered to students during the first few weeks of the course. The survey contained four open-ended text entry questions. Thirty-eight students completed the survey (100% response rate). The semi-structured interview and focus group were conducted and recorded online using the Blackboard Collaborate meeting tool approximately three weeks before the course ended. The focus group was attended by two students and the instructor was also interviewed. Questions for the focus group and interview were synthesized from distance education surveys as well as from an interview protocol used in other studies that have looked at the nexus of technology and art education (Petrides, 2002; Skordis-Worrall, Haghparast-Bidgoli, Batura, & Hughes, 2015). Near the end of the course, a posttest survey that contained five open-ended text entry questions was administered. Nine students completed the survey, giving a 30% response rate. The low response rate was due to a misunderstanding between the researcher and the teacher about the date of the survey (students who were seniors had already graduated when the posttest survey was administered).

After transcribing the focus group and interview audio files, the transcript was reviewed by the researcher to ensure accuracy. The constant-comparative method was used to code the interview and focus group transcripts with a goal of categorical saturation, as described by Lincoln and Guba (1986), and with an awareness of and correlation with pre-and posttest data. To do this, an initial codebook was developed, which included each code, a definition of the code, and guidelines for using the code. A confirmatory analysis was also conducted by a colleague in the same college through three rounds of coding. The four themes that emerged—subject matter, technology, pedagogy, and instructor—fit the context of the Gallery 5 environment.

Qualitative Results of Pretest Qualitative Survey

A pretest survey was administered to students during the first few weeks of the Art Appreciation: The American Identity course. Students answered the pretest question, "Why did you decide to take this class?" in two main ways. First, 39% of students (n = 38) indicated that they took the class either to fulfill a requirement, or that they were, "put into the class." Also, 61% of students indicated that they took the course because they were interested in art. For example:

> "I decided to take this class because I have an interest in history and art."

> "I decided to take this class because I have, and always have had, an interest in art and artwork. I like to create digital art myself and enjoy learning about famous artists and works in the world."

> "I love learning about, looking at, and making art, which is what made the course so interesting for me."

> "I decided to take this online class to broaden my awareness and knowledge in art history. I have never participated in an online course before and many of my friends that have, say it is a great learning experience."

It should be noted that with such a great dichotomy of motivations, there was bound to be some conflict and discord between the course experiences of students who did not have an interest in art and those that did. Those who had a strong motivation and proclivity toward art and learning about art may have been more likely to express strong, positive opinions of their experiences in the Art Appreciation: The American Identity course, while those who did not like art, may have been more likely to express apathetic or negative opinions.

Students answered the pretest question, "What do you hope to learn/gain from this class?" in several ways. Forty-four percent said that they were concerned with gaining academic content knowledge in art history (n = 18). Second, 37% stated that they were "forced" to take the course either because it was the only elective available, or, because they were placed into the course without their consent (n = 15). Seven percent of students mentioned that they wanted to learn more about Crystal Bridges Museum of American Art (n = 3), another 7% (n=3) wanted to learn how to critique art, and 5% (n = 2) wanted to improve their own skill in creating art. These last few survey response themes are best summed up in the following quotation:

> I want to learn more about the study of art—how to critique and properly judge artwork from a professional position. I believe this knowledge will help me further my understanding and enjoyment of art, as well as my ability to make it. I also enjoy learning about artists and what inspired them.

The same dichotomy of motivations for taking the course noticed in the last question was present in this one.

Students who answered the pretest question, "What are the three most important weaknesses of the museum?" focused on the artwork, the building, and the overall structure. The artwork was criticized for a lack of modern art pieces and sculpture, an overemphasis on older art, the nude nature of some sculptures, and a lack of description on some artwork. Students critiqued the building from their experiences for its large size ("too big"), color, surroundings, and the lack of nature trails for disabled individuals. The structure was denounced for overly strict rules, unknowledgeable tour guides, and a difficult to navigate web presence.

Students who answered the pretest question, "What are the three most important strengths of the museum?" focused on the artwork and the building. The artwork was lauded for its wide variety, quality, arrangement, and placement:

> "There is no solid, forced separation between the viewer and the art, giving the viewer a better understanding and appreciation of the artwork."

> "The temporary parts of the museum vary greatly and give the public a taste of many types of art, which is very appreciated. There is usually some new artwork there all the time for those who can't go as often as they might like."

> "The art work is in very good shape, they care about what they are presenting."

> "The way the artwork was arranged. It was arranged in a way for you to capture the true beauty of the art piece in the correct lighting and placement."

The building was also praised for its design and supporting facilities (restrooms, eateries, and nature trails). It was celebrated as a "great place to explore" and described as capable of "catching people's attention." Only five of 39 students (13%) had been to Crystal Bridges Museum of American Art prior to the beginning of the course and visiting the museum in person was not part of the course. This information is important because it highlights the fact that students were commenting in the pretest on the virtual experiences they had with the museum through the Art Appreciation course and Gallery 5 environment, not the actual art museum.

Qualitative Results of Interviews and Focus Group

Subject Matter Content

A major theme that emerged from the interview and focus group sessions with the instructor and students was their experiences with the art and art history academic subject matter that was addressed in the Art Appreciation: The American Identity course. Students emerged from the course with an increased knowledge of American art, but not much desire to continue learning. "I learned a lot more than I thought there was," said one student, "…but I think I learned enough." Students also said that as a result of the course they were more interested in American art but not to the point of physically visiting Crystal Bridges Museum of American Art or another art museum. Instead, their increased interest came in the form of multiple occasions where they noticed an American art related link or advertisement and followed up by clicking on it. "I'm more likely to click a link (about art)" said one student. Another student shared, "I'm maybe a little more interested (in American art). It increased my interest just a little bit more because I got to learn a little bit more about it. I will do more online stuff with it." These responses are important because they show that the students' online experiences with the art and subject matter resulted in a desire to find more online experiences, but it did not transfer to an increased interest in offline art appreciation activities.

Specific content learned was the history and background of artists and specific works of art. The instructor was particularly impressed with a few of the students who appeared to go beyond learning the content to adopting what seemed to be an ongoing interest in American art:

> We did have one student who was failing the course and he was always telling me he's not a fan of art. When the art project came out it was abstract expressionism and I was trying to explain what they needed to do. I knew he lived on a farm and I asked, "What have you got laying around in your farm that's just scrap and would

normally be discarded?" He said, "Well we've got a bunch of scrap metal." I said, "Well use that." He says, "Can I weld it?"—because he knows how to weld and he came up with this awesome piece. He called it "all screwed up." He used bolts and screws and things that he welded together. It was really cool and I was thinking yeah…It's great to see students connecting with the content and kind of getting what you're saying.

Despite their insistence that they were uninterested in future exploration of the arts and art history, students indicated that the Art Appreciation: The American Identity course increased their comfort level with discussing works of art and helped them learn more about how to create art themselves. "It just got you comfortable with talking to other people about it – I can talk to others about different works of art now," said one student, specifically pointing to her increased understanding of the vocabulary of art criticism and art history as being a help. Students also pointed to what they called the "process" parts of the course as their favorite, specifically, "I liked making our own art… the Gallery 5 experience was cool." Of note here also, was students' lack of increased interest in American history, "I just don't like history," said one student. "I'm with her on that one," said another student.

Technology
Another major theme that emerged was that students were mostly interested in the technical processes and skills involved with curating art in the course. One student said, "The gallery stuff was really interesting…I like that stuff because it helped me see how you do it in the real world." Students centered on their ability to feel present in the Gallery 5 environment saying that "…you could walk around in it…[it] felt real." The instructor said that Gallery 5 was the capstone experience and brought everything the students were learning together in one activity. However, students were not entirely positive in their evaluation of Gallery 5. "It wasn't the best I had ever done (in terms of immersive environments)" said one student. The student continued, "this was alright, I guess, I don't know. I wasn't expecting doing that sort of thing this year, but it also wasn't like a normal game with quests and stuff." This data helps to highlight both a strength of the Gallery 5 environment – the ability to feel physically present in an online environment, and a potential weakness – the lack of scaffolding in the form of a quest or search made in order to complete a task. If no future game elements such as a win scenario, conflict, or rule set are added, then students would benefit from having a clear explanation that Gallery 5 is a simulation, not a game. Providing students with this knowledge in advance could reduce the disconnect between their expectations and the reality of the activities in the space. Further, in the previous response the student obliquely refers to the graphical fidelity not being as high as what they have experienced in other digital spaces like video games. This gap in graphical sophistication has been a problem with academically created games and simulations in terms of their ability to effectively impact learning (De

Giovanni, Roberts, & Norman, 2009). In addition, students have noted that lower graphical quality engines negatively impact their engagement experiences (Warren, Jones, Dolliver, & Stein, 2012), which indicates the quality of graphics used in academic games should be a consideration in the design process.

Pedagogy

Another major theme that emerged from the qualitative data involved the pedagogical methods used in the art appreciation course. Because this course involved teaching both content knowledge and skills in the academic discipline of art and art history, it is helpful to consider the notion of signature pedagogies. Lee Shulman (2005) defined signature pedagogies as, "types of teaching that organize the fundamental ways in which future practitioners are educated in the professions." Employed here, it helps frame a discussion of one type of instruction that appears to fit art and art history.

The signature pedagogy used in the course was grounded in the theory of situated cognition, specifically the cognitive apprenticeship. As described previously, situated cognition occurs when students learn from an expert by observing, enacting, and practicing expert actions with guidance (Brown, Collins & Duguid, 1989). The Gallery 5 immersive environment was designed to provide a real-world context and situation in which students could learn the process of curating an art collection. Although it was an atypical form of pedagogy in the instruction of art and art curation, the instructor seemed to prefer the cognitive apprenticeship model when she talked about the hands-on mentoring opportunities that were missing in most online courses:

> I did a site visit to one of my schools and…they were working on projects…I saw instances where being there in the room with them could help students quite a bit. I had an opportunity to help show a student how to do something that he wouldn't have gotten just strictly online because I was there in the process…I've been teaching art for 12 years so those are the things that I realized going on the site— that there are little opportunities that are missed because you're not right there with the students.

The instructor also felt the art appreciation course was missing this aspect of being with the students to help them at just the right moments when they need support. However, there is potential for the instructor's concern for "being there in the process" to be addressed in connection with the students' feelings of being present in, and their sensation of being able to physically navigate, the Gallery 5 environment. The instructor's concern speaks to the potential need to develop a pedagogy of presence in the online course—a way of teaching that emphasizes real time opportunities for a teacher to interact with and mentor students within an

online environment that allows students to feel present with others while completing authentic, art-related tasks. Further, the instructor was not trained in the core elements of cognitive apprenticeship or the expectations and approaches a teacher should use relative to either the pedagogical method or how it was employed within Gallery 5. Training in these areas should improve learners' experiences in the future, a finding echoed by Warren, Dondlinger, Stein, and Barab (2009) in their study of the Anytown literacy game.

Instructor

The last major theme that emerged from the qualitative data focused on the instructor. The instructor of the Art Appreciation: The American Identity course was well qualified in terms of her educational background, content level courses taught, and online instructional experience and preference. She possessed an entrepreneurial spirit that motivated her to volunteer to teach the course, and the same attitude enabled her to learn alongside her students. Additionally, at the time of the study, she was already thinking about the next time she would teach the course, revealing a long-term approach to success and iterative changes. The instructor also discussed innovative ways to improve the course, such as the use of a document camera so that she could demonstrate art techniques in a live, online meeting. In addition, she discussed changes to the final project, video learning objects, and a way for students to share their work with others:

> I would envision it to be … the final exhibit to be done all virtually where there are art work descriptions and music and everything is all together in one spot virtually in Gallery Five so that they're not doing different things… they're not using a bunch of tools but instead they're only using one. If you could build a tool where the students could make a video of their Gallery 5 exhibits so that they can download it and keep it, that would be ideal I would think. They can actually be talking to somebody through the tour; they could be the tour guides. That would be awesome. Then there'll be something students could share with an external audience.

Qualitative Results of Posttest Qualitative Survey

A posttest survey was administered near the end of the semester, containing five open-ended text entry questions. Nine students completed the survey (30% response rate). The low response rate was due to a misunderstanding between the researcher and the teacher on when the survey was to be administered. As a result, it was administered after many of the seniors had finished the course. On the posttest survey, students indicated that they gained academic content knowledge about specific pieces of art and artists (21%, n = 3), the stories behind the art and how art impacts history (43%, n = 6), and the conceptual ideas that art communicates (21%, n = 3). A single participant mentioned, "…the skill of talking about pieces of artwork

and communicating with others," and another mentioned curation as a skill learned in the course.

Most students answered the posttest question, "Which aspects of the course were most important?" with a focus on content. For example, students mentioned art that spoke to the issues of slavery, war, and different cultural norms. However, one student appeared to be deeply impacted in her ability to discuss art in a meaningful way:

> I felt that sharing how one understood the artwork or the art movements was one of the most important parts of this course. Getting to share my own feelings and being able to read what other people thought was very important to me. It gave me a very wide range of ideas that I could mold to form a brand-new opinion, and I feel like that is a very large part of understanding art. I absolutely loved being able to share and be shared with.

Students answered the posttest question, "Which aspects of the course need improvement?" with emphasis on the usability of the discussion board and VoiceThread, a website where people can interact around a topic through text, audio, and video postings. Also, students offered suggestions such as improving video selection by making the videos more fun and increasing the amount of sharing between students.

Students answered the posttest question, "In your opinion, what were the three most important strengths of the museum?" with a focus on the art work first, then the structure, and finally technical difficulties. Artwork was praised for its quality, quantity, variety, historical range, and curation. For example, several students mentioned something similar to the following: "Exhibits are curated in incredibly meaningful and relatable ways," and said that the art collection was from a "wide variety of art movements and genres." Structural assets included the external architecture of the buildings, but also the quality of the personnel, background information on the artwork, and the cleanliness of the museum:

> "They have people that will tell you about the artwork in every room."

> "They have good detail on the tags beside the artworks."

> "The museum is always clean and keeps the paintings arranged correctly."

Some students also confused this question as referring to the course, because their answers focused on things like the videos and VoiceThread lessons in the Art Appreciation: The American Identity course.

Students answered the posttest question, "In your opinion, what were the three most important weaknesses of the museum?" with their focus on structural and technical concerns, and a few comments about the art. Students listed limited hours of operation as a weakness, and also offered ideas for museum improvements such as an entrance to the ground floor from the gardens, more live guides, easier navigation, and audio for every painting. Some students also confused this question as referring to the course, because their answers focused on things like the discussion board and tagging art with keywords in the Art Appreciation: The American Identity course. One student persisted in criticizing the lack of modern art and sculpture.

Scholarly Significance and Discussion

It is interesting to note an evolution in students' answers to the questions about the weaknesses and strengths of Crystal Bridges Museum of American Art from the pre-to the posttest. Pretest weaknesses primarily criticized the artwork, and then addressed secondary concerns in the building and overall museum structure. However, these weaknesses changed in importance on the posttest, with students now being more concerned with building and structural concerns, and very little focus on the art work. In contrast, pretest strengths lauded the art work, then addressed secondary strengths in the building, and these remained the same in importance on the posttest. However, students used a vastly different, more nuanced vocabulary in describing the art and museum structure on the posttest than they did on the pretest. Also, they communicated a more in-depth knowledge of art history, including art movements, genres, historical trends, and even architectural types.

It is also important to note that while some students entered the course with a keen interest in art, an equal number were only taking the course as a graduation requirement, a factor that impacted their personal learning objectives (or lack thereof) for the course. Thus, it should not be a surprise that students mostly stated that they reached lower-level learning objectives focusing on the acquisition of art history content, and not the higher-level learning objectives that pinpointed skills in analysis and evaluation.

Recommendations

The art appreciation course that has resulted from the partnership between Crystal Bridges Museum of American Art, Virtual Arkansas, and the Educational Development Center provides a rich art history experience for students in 9th through 12th grades. It includes a carefully selected variety of American art images, thoughtfully authored multimedia learning objects, and interesting and compelling assessments.

With that said, this qualitative pilot study revealed several concerns that, if addressed, should result in an improvement of student learning. Recommendations toward improved student learning are as follows:

1. **Provide helpful tutorials in both traditional and non-traditional distance learning technologies**
   Students were not prepared to use either the traditional distance learning technologies (e.g., discussion boards, videos) or the non-traditional ones (e.g., Kapsul, Gallery 5), and this led to a greater learning curve for students than expected. Video and pdf tutorials should be provided for these and other online tools used in the course; and all of these tutorials, including one for each task within the Gallery 5 environment, should be linked within each assignment that uses them.

2. **Add an orientation experience for the Gallery 5 immersive environment**
   Provide an orientation period in the Gallery 5 environment where students complete similar, but not exact, activities to those required in assignments. This will provide needed scaffolding for students to slowly grow in their confidence and expertise with the environment.

3. **Expand the use of the *Gallery 5* immersive environment**
   Despite the high enrollment of uninterested students in the course overall (39%), the Gallery 5 portion of the course still maintained a student engagement level of 44%, of whom 55% felt the environment seemed natural and 40% felt spatially present in the Gallery 5 environment. The high level of student attraction to this learning activity should be capitalized on. While the course described in this pilot study only used Gallery 5 as part of the midterm and final project, expanding use of the environment to 50-75% of the course could help engage more students. Use of Gallery 5 in a stepwise fashion to scaffold students in both the technical and artistic usages of the environment would help them to learn and use the environment in bite-sized chunks rather than all at once.

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About the Author

Dennis Beck is an Associate Professor of Educational Technology at the University of Arkansas. His research focuses on and advocates for digital, educational equity for vulnerable populations, with an emphasis on culturally and linguistically diverse and special education students at the primary and secondary levels. In this stream, he has studied the influence of student and teacher avatar gender and race on expectations, perceptions and evaluations. He has also examined the use of immersive learning environments for providing life skills training for low functioning young adults on the autism spectrum. Additionally, in order to better understand the impacts of immersive environments in cyber schooling on vulnerable populations, he has studied an immersive art curation environment in partnership with a local

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