

Augmented Reality in Art Education

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Abstract

As digital media changes constantly, art education must stay updated with current and emerging technologies and pedagogies in order to stay relevant. One specific technology that has many potential applications in the art classroom is augmented reality (AR), as its uses are diverse and can offer engaging and collaborative experiences to students. This qualitative research examines possible ways in which AR can be utilized in art education, while also studying whether or not AR can enhance three different learning activities set to students in 3rd-10th grade.

Augmented Reality in Art Education

In an art classroom, students' creative experiences are often based on teacher-directed assignments instead of more meaningful, personalized, and inquiry-based activities. There is a current demand to move toward a more personalized and inquiry-based education, thus leaving behind the direct instruction pedagogy that still dominates public schools (Bartle, 2013). One of the recommendations for personalizing education is to increase the use of Personalized Learning Environments (PLEs), flipped classrooms, blended learning, and technology (Burke & Fried, 2013). In particular, mobile technologies have increasingly become more pervasive in the personal lives of teachers and students, and as such, many schools have been trying to implement mobile learning through Bring Your Own Device (BYOD) policies (Grant, Tamim, Sweeney, & Ferguson, 2015). With 75% of teenagers 13 to 17 years old reporting that they have or have access to a smartphone, administrators are seeking to advance learning opportunities with mobile computing devices (Lenhart, 2015).

One type of emerging technology that can be used in conjunction with mobile devices is augmented reality (AR), which has already been proven to help in areas such as reading comprehension and spatial awareness (Billinghurst & Duenser, 2012). The purpose of AR is to augment, or enhance our real-world environment by superimposing images, videos, information, or audio onto it (Bonsor, 2016). If a student with a mobile device wanted to access AR, they would scan a trigger image, which would then result in an AR response (Brown, 2015).

What makes AR worthwhile for education is that it helps to create a more interactive learning environment for students, where they're given an opportunity to design and share their learning experiences (Nesloney, 2013). Blending "the physical and virtual worlds so that real objects can be used to interact with three-dimensional digital content" allows students to participate and collaborate more naturally with digital media (Billingham & Kato, 2002, p. 2). Students engage in and experience augmented reality, making it a less static means of learning (Craig, 2013).

Little research has been conducted on using augmented reality in art education. However, a quick Internet search will reveal different AR apps that can be used in art activities; what can't be found is the impact those activities had on students. This descriptive study will establish answers to the following research questions:

1. What are some of the uses of augmented reality in art education?
2. How can augmented reality be used to add breadth and depth to art education activities?

Technology in Art Education

As various technologies become more embedded in daily use, it is important to reflect on how current and emerging technologies can enhance education (Buffington & Patton, 2016). Specifically, it is important to examine the impact of digital media on art education, as this discipline is in the unique position of teaching students how to analyze and critique emerging technologies as well as how to use them (Choi & Piro, 2010; Türkan & Yaşar, 2011).

Use of technology in art education can be found as early as the 1960's, which coincidentally is when Ivan Sutherland produced the first augmented reality system

(Arth, Gruber, Grasset, Langlotz, Mulloni, Schmalstieg, & Wagner, 2015; Buffington & Patton, 2016). By the 1980's, technology in art education began to increase as more classrooms began incorporating personal computers as learning resources (Buffington and Patton, 2016). When sped up to current art education practices, research shows that technology is primarily being used to gather information for traditional media art products via the Internet instead of being put toward collaborative and inquiry-based lessons (Roland, 2010). Many K-12 art educators feel that technology has no place in their classrooms and that students must first have a strong grasp of basic art elements and design principles (Balsey, 2014).

For other art educators, there isn't enough training or technical support offered; teachers don't feel prepared to integrate different types of hands-on technology with their students and thus resort to using it to present information, if they use it at all (Moeller & Reitzes, 2011). Recent findings also show that there has been a 21% reduction of art funding and that 19% of art instructional time has been cut in the aftermath of the No Child Left Behind Act (Black & Browning, 2011).

After researchers Black and Browning (2011) questioned why art educators were slow to integrate technology into their curriculum, they proposed that using emerging digital media would not hamper the art process, but instead permit art students to take risks and discover new ways of creative thinking. Over a period of three years, pre-service art teachers were given a common theme in which they had to instruct their secondary students how to use digital media; the theme was similar, yet slightly different each year.

During the first year, teachers and students were given very structured assignments and software to use. During the second and third year, teachers were allowed to interpret the given theme however they wanted and decide what type of technology to pair with it. Black and Browning found that teachers and students responded more positively in the research during the second and third year when, “they focused on creative ideas and not technology driving the curricula, and were given freedom to shape creative digital arts programs” (p. 24). The research ended by concluding that the teaching of traditional and creative art creates a framework for digital art, and that the two pedagogies have the potential to come together to be more effective.

The Potential of Augmented Reality

In a time when many education budgets are being reduced, it may be prudent for art teachers to pursue both traditional and digital media arts professional development in order to maintain the relevancy of art education in today’s academic landscape (Choi & Piro, 2009).

One such digital media includes augmented reality, a technology that was given three widely recognized traits in 1997: it merges real and virtual data, it can be interacted with in real time, and it is used in a 3D environment. Continued AR advancements were made, as were developments in mobile technology, until the two could be combined and thus used anywhere, any time (Arth et al., 2015; Craig, 2013). Although head-mounted displays are also still being developed, the price tag associated with such technology makes them an unrealistic tool for education (Brown, 2015).

The ability to make AR more mobile and affordable creates educational opportunities for differentiation, as well as giving students an opportunity to, “manipulate

virtual objects or representations of real objects that would otherwise be impossible to hold as well as learn tasks and skills. The benefit with AR learning is that there are no *real* errors only various degrees of learning experiences” (Antonioli, Blake, & Sparks, 2014; Kipper & Rampolla, 2012, p.19-20). Content can also be personalized to what users want to learn about (Godwin-Jones, 2016).

As there is a current lack of data on how augmented reality can be utilized in a meaningful way for art education, this study aims to begin examining the various possibilities of AR.

Method

Participants

Participants in the sample include sixty visual art students (26 girls, 34 boys) at an international school in China; seventeen are in 3rd grade, 18 are in 4th grade, ten are in 5th grade, ten are in 6th grade, three are in 9th grade, and two are in 10th grade.

Materials

Aurasma. Students in 9th and 10th grade used the mobile application Aurasma to respond to an artwork they had previously created. Aurasma is a free AR application that users utilize to create their own content; once a user has designated a “trigger” image, any mobile device can scan said trigger, which will then produce an AR experience, or “aura.”

Quiver. Quiver is an AR application primarily for the use of children; the application provides coloring pages to be downloaded and printed out and users are able to decorate these pages before scanning them with a mobile device. An AR experience will then be generated.

Visual Arts Student Questionnaire (VASQ). This questionnaire is separated into two sections: 3rd-6th grade and 9th-10th grade because the learning activity the 9th and 10th grade students participated in was based off of their original artwork. Students in both sections were given a short series of opinion questions on the AR lesson they participated in.

Background Questionnaire. All participants were given cover letters and background questionnaires. All students were asked to provide their grade level, age, gender, and frequency of mobile device usage.

Procedure

After reviewing current research on art education and on augmented reality in education (Godwin-Jones, 2016; Antonioli et al., 2014), three learning activities were designed to determine potential applications of augmented reality in an art class.

Third and fourth grade students were all given a selection of coloring pages to be filled in; the pages had been downloaded from the Quiver website and printed out. Students had previously been told that they would be using tablets to scan the coloring pages, which then elicited an AR response. Once students had finished, they wrote a brief story about the characters they had colored in and shared these with their classmates.

Fifth and sixth grade students were put into groups of three to four people, with each group choosing a famous artwork to research. After gathering information about the chosen artwork, each group filmed their team members presenting their findings. Students then used the Aurasma application to upload their videos and embed them into the famous artwork that had been selected, which served as a trigger image. Color printouts of the famous artworks were printed out and attached to a bulletin board in the

school hallway outside the art classroom, with instructions on how to use the Aurasma application. Fifth and sixth grade students viewed and critiqued each other's work and other grade levels took turns using tablets to experience the AR in the hallway.

This photo is an example of an AR response triggered by student artwork.

Each student in 9th and 10th grade used Aurasma to create an artist statement about artwork they had created. Students recorded audio of their written artist statement and embedded it into photos of their pre-artwork sketches, as well as video of themselves creating their pieces from start to finish. The completed artworks were used as the trigger images and were placed in the school lobby with instructions on how to use Aurasma.

The opinion items on the VASQ were composed based on the research and descriptions in other studies, as well as the needs of the school.

Analysis

Open-ended questions on the VASQ were categorized by related themes and frequency of responses.

Results

The majority of 3rd-6th grade students had previously experienced some form of augmented reality, most of which included the game Pokémon GO, but no 9th-10th grade students had used AR before. When asked for their opinion on using AR, most 3rd-6th grade students said that they found it to be fun or that they enjoyed getting to do something unusual; all 9th-10th grade students said they found AR interesting and/or new. The majority of 3rd-6th grade students reported that using AR helped them to learn about art, although most did not specify how; two 9th-10th grade students stated that it helped them and two mentioned that it made them think more about how people interact with art.

When asked what they would change about using AR in art class, forty-two 3rd-6th grade students said that they wouldn't change anything, ten said they wanted AR to make all of their artwork come to life, and three said they wanted to use AR to make artwork; fifty-three 3rd-6th grade students wrote that they would want to use AR again. Concerning how AR might change the way in which viewers perceive artwork, two 9th-10th grade students mentioned that people get to see the art process, three stated that the final artwork becomes more meaningful to viewers, one reported that public artwork is more participatory with AR, and two said that the process becomes as important as the product.

Discussion

Limitations

The learning activity for third and fourth grade students may have been skewed, as there were not enough tablets for every individual and thus students had to wait before using the Quiver application.

Implications

Based on the data, nearly all students responded favorably to the use of AR in an art environment. However, although the majority of 3rd-6th grade students answered that using AR helped them learn about art, teacher observation of the 3rd-4th learning activity found that students seemed to be more interested in use of the Quiver application than writing their stories or coloring the printed out images. What was not anticipated was how many students in 3rd-4th grade began making their own AR artwork by using Quiver's filming function to record their artwork that had come to life; while the written stories seemed to be unenthusiastic, students using the filming function were narrating their AR movies with a great deal of enthusiasm, creativity, and detail.

Students in 5th-6th grade almost all reported that they enjoyed getting to show what they learned in a new and different format. When viewing the research of their peers, students were observed discussing the AR experiences and paying close attention after using tablets to scan selected famous artworks; six of the 5th-6th graders were seen scanning the artwork again, outside of art class on their own time.

Only one student in the 9th-10th grade class stated that they would not want to use AR again; it should be mentioned that this student's opinion may be influenced by the personal belief that artist statements are unnecessary and that providing one distorts how a person views an artwork. The student who said this still wrote that the AR was interesting to use and that it made their artwork more interactive for people looking at it. Other students were observed to be engaged and taking more ownership of their artist statements and what would be presented to people viewing their artwork than they had with previous assignments.

Future Research

Determining potential uses for augmented reality in an effort to enhance art education requires being open to unanticipated outcomes, such as what occurred with the third and fourth grade students who decided to film their AR experience with the Quiver application. Otherwise, AR is just another classroom tool whose use is determined by the instructor instead of the learner. As long as art teachers are willing to experiment with digital media instead of excluding it in favor of traditional art media, emerging technologies like AR have the potential to increase collaboration and opportunities for students to share what they're learning in new ways.

Further research needs to be conducted on the long-term use of augmented reality in an educational setting and how to implement it most effectively. As the technology of AR continues to change and expand, its impact on learning will also vary (Billinghurst & Duenser, 2012; Bonsor, 2016). Other potential research in art education could include exploring the use of AR to reach members of a school community who speak a different language; an English-language learner, for example, could scan an artwork and learn about it in their native tongue. Yet another and powerful use of AR might incorporate interactivity by allowing students to respond to each other's artwork by adding their own AR experience to the same trigger image. This would mean that when a viewer scanned an artwork on display, they would be able to look at the artist's thoughts as well as the suggestions or comments from other viewers.

Ultimately, the possibilities for AR in art education are many and the technology's ability to add breadth and depth to learning is there, as long as it's utilized in an appropriate and meaningful way. As AR and other digital media continue to develop and change, so too should art education.

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Appendix A

University of Arizona South
Educational Technology Program
1140 North Colombo Avenue
Sierra Vista Arizona 85635

September 24th, 2016

Dear Mr. and Mrs. _____,

The Department of Educational Technology at the University of Arizona supports the practice of informed consent and protection for human subjects participating in research. The following information is for you to decide whether you will allow _____ to participate in the present study. You are free to withdraw his/her participation at any time.

_____ will be asked to answer 9-10 questions concerning his/her opinions on using augmented reality in art class. I am interested in determining how augmented reality impacts and possibly enhances art education. The answers given by 3rd-10th grade art students will help direct future technology use in the art room.

Your child's participation is solicited but is strictly voluntary. I assure you that your child's name will not in any way be associated with the research findings. The information will be identified only through a code number.

If you would like additional information concerning this study before or after it is completed, please contact me by phone or email. Thank you very much for your time and I appreciate your interest, cooperation, and participation.

Sincerely,

Devin Smith
devinsmith@qingdaoamerasia.org
(185) 6146-1271

We give permission for _____ to participate in the above described research study.

Parent Signature

Date

Parent Signature

Date

Appendix B

Visual Arts Student Questionnaire

I. Background Questions

Directions: Please answer the following questions.

1. What grade are you in?
2. How old are you?
3. What is your gender?
4. How often do you use a mobile device (phone or tablet) every day?

II. AR Questions: 3rd, 4th, 5th, and 6th Grade

1. Have you used any augmented reality applications before?
2. What did you think of using augmented reality in art class?
3. Did augmented reality help you learn about art? Please explain.
4. What would you change about how augmented reality was used in art class?
5. Based on your experience in class, do you want to use augmented reality again?

III. AR Questions: 9th and 10th Grade

1. Have you used any augmented reality applications before?
2. What did you think of using augmented reality in art class?
3. Did augmented reality help you learn about art? Please explain.
4. What would you change about how augmented reality was used in art class?
5. Based on your experience in class, do you want to use augmented reality again?
6. Do you feel that augmented reality changes the way people view your artwork?
Please explain.

Appendix C

AR Interview Frequencies: 3rd – 6th Grade

Have you used any augmented reality applications before?

No	Yes
18	37

What did you think of using augmented reality in art class?

It was fun	I liked making my own stories	I liked seeing my artwork come to life	I liked doing something I don't usually get to do at school and/or art class
24	9	3	19

Did augmented reality help you learn about art? Please explain.

I got to show what I learned in a different way	People were more interested to learn when they got to use AR	AR did not help me to learn about art	AR helped me to learn about art
9	7	6	33

I got to show what I learned in a different way	People were more interested to learn when they got to use AR	AR did not help me learn about art
25	9	21

What would you change about how augmented reality was used in art class?

I would not change anything	I want AR to make all of artwork come to life	I want to use AR to make artwork
42	10	3

Based on your experience in class, do you want to use augmented reality again?

Yes	I want to learn more about AR
53	11

AR Interview Frequencies: 9th and 10th Grade

Have you used any augmented reality applications before?

No
5

What did you think of using augmented reality in art class?

It was interesting and new	It made my artwork more interactive
5	1

Did augmented reality help you learn about art? Please explain.

No, it did not help me	It made me think more about how people interact with art	Yes, it helped me
1	2	2

What would you change about how augmented reality was used in art class?

Nothing	I want to use AR to make artwork
3	2

Based on your experience in class, do you want to use augmented reality again?

No	Yes
1	4

Do you feel that augmented reality changes the way people view your artwork? Please explain.

People get to see the process	Final artwork becomes more meaningful	Artwork is more participatory	Process is as important as product
2	3	1	2