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Assessing Visual Literacy Learning

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Abstract

There is an ever-growing need for students to possess well-developed visual literacy skills. ARTiFACT, a problem to project-based interdisciplinary curriculum, was designed to help meet this need. Specifically examined in this pilot study was the module of ARTiFACT called Developing History, which strives to help students tie the formal features of photography to the intended meaning of a photograph. By comparing students' visual literacy abilities prior to and after use of Developing History, the effectiveness of the module was examined. Several measures were used to address this question as well as to answer more specific questions relating to whom, if anyone, best benefited from Developing History. The first two measures examined the quality of students' answers in relation to tying formal features to the meaning of a photograph. The third measure analyzed the consistency of student performance in regards to both differentiation and problem-solving skills. The final measure offered students a chance to apply their formal feature knowledge and examine the effect of context on their decisions. Results of the pilot study suggest that Developing History is an effective tool for teaching visual literacy skills to a subgroup of the middle school population. Further studies need to be conducted to examine extending the efficacy of the tool and expanding the population who may benefit from using it.

Introduction

The module of ARTiFACT examined, Developing History, strives to build visual literacy skills by enabling students to form stronger connections between the use of formal features in photography and the meaning of an image. To this end, the pilot study conducted looks at the practical nature of ARTiFACT's use in the classroom. The study was designed to answer the question, "Do students more successfully tie formal features to the meaning of the photograph after using Developing History?" This question fits in well with the overall

intended purpose of ARTiFACT, which is to build visual literacy skills in middle school students. It is the hope that, after experiencing ARTiFACT, students will become intelligent consumers of visual information and messages. Ideally, students will look more critically at visual messages and analyze the intent and context of those messages.

The module Developing History offers students numerous opportunities to closely explore the formal features of photography and their connection to the intended meaning of a photograph. The design of the tool creates a learning space that facilitates conceptual art understanding, providing a principled way to teach visual literacy skills. Thus, assessing student learning after the use of Developing History offers the opportunity to examine their learning of those skills.

The study conducted assesses students' learning by testing students' visual literacy skill level both before and after using Developing History. By comparing pre- and post-test results, evidence of visual literacy learning can be examined. The inclusion of additional measures in the post-test offers more evidence of the students' ability to apply visual literacy skills and allows for more a more refined examination of how the tool aids the learning and who, specifically, the tool helps. Thus, both the tool and the study allow for a logical examination of visual literacy learning.

Description of ARTiFACT

Designed for middle school students' use in the classroom, ARTiFACT offers an innovative approach to build visual literacy skills through a series of interactive on and off the computer experiences or modules. ARTiFACT provides not only rich content and engaging activities but also presents comprehensive supporting materials for educators such as background

information, standards, assessment rubrics, and resources. The overarching goal is to build students' visual literacy skills in an effective and practical manner.

Developing History, the module of focus, aims to promote a lasting ability to critically analyze photographic images used to record history. This experience provides opportunities for students to "read" and produce photographs that communicate history and culture. The module focuses on building visual literacy skills through the analysis, evaluation, and creation of photographic messages tied to the theme of equality in history. Students focus on photographs related to the Civil Rights Movement by progressing through cycles of guided exploration, individual exploration, observation supported by contrasting cases, and self-assessment. Throughout the experience, students are required to continually interact with the photographs to help them understand the way the formal features of photography are used to convey intended messages.

General Description of Experiment

To assess Developing History's effectiveness in increasing students' ability to link the formal features of photography with intended meaning, we conducted a within-subject experiment with 17 sixth grade students at Keys School, a private school in Palo Alto. Since the learning experience relies on the differentiation learning mechanism, our design focuses on evaluating the students' ability to notice.

For the first and second measure, the independent variable was the use of ARTiFACT. The pre-test included a set of three questions. Students were shown a photograph and asked to answer the following three questions: 1) what do you notice about this photograph? 2) what do you think the photographer was trying to convey through this photograph? 3) what were

the choices the photographer made when composing this photograph? In addition to the first measure consisting of the abovementioned questions, the post-test included three other measures. The second measure involved students answering the same three questions in response to a new, transfer image. This measure attempted to show whether students were able to transfer their visual literacy skills to a new image. It is important to highlight that the transfer image (a photograph of the Montgomery Bus Boycott) related to the topic covered in Developing History (Civil Rights Movement), although students were not told of this relationship. The third measure involved students ranking four versions of the same photograph based on the effectiveness of each image to convey a particular message. Finally, the fourth measure required students to crop an image. Within this measure, we used a between-subject design. Half the students were provided with the context of the image as well as directions to crop the image to tell a specific story. The remaining students were not provided with the context and were simply asked to crop the image.

The dependent variable for all the measures was the quality of students' answers. Specifically, we looked for evidence of students' increased awareness of meaning in images and improved articulation and use of key vocabulary. For post-test measures 3 and 4, we not only looked for students to make the best choice but also looked for evidence of clear and logical rationale behind their decisions. At the conclusion of the assessment, if students showed increased awareness of the use of formal features and connect their use with meaning, Developing History has proved successful in achieving the desired learning outcomes.

Methods

Participants

Given that Developing History is designed for middle school students, the selected

participants were 17 sixth grade students at Keys School, a private K-8 school in Palo Alto.

Keys School was chosen simply because easy access was granted to the students and facilities.

Initially, the goal was to assess the project with seventh grade students but after speaking

with the technology and art teacher at the school, it became apparent that the seventh grade

students were tainted as they had already completed a course on photography. The

technology teacher recommended involving the sixth grade class as they had no prior formal

photography training and were equally as mature and capable. The subjects comprised of 9

females and 8 males. All the subjects appeared comfortable and fluent in computer use.

Materials

Pre-test materials:

> Paper and pencil
>
> One presentation computer with Internet access
>
> Projector connected to the presentation computer
>
> White board (on which to project on-line photographs)
>
> Black and white photograph for measure 1 (see appendix 1 for photograph used)
>
> *Photograph chosen made effective use of formal features of photography.
>
> Computers for each subject with Internet access and Shockwave installed

Post-test materials -- same as above including:

> Transfer black and white photograph (measure 2, see appendix 2 for photograph used)
>
> * Again, photograph chosen made effective use of formal features of photography. In
>
> our experiment the transfer photograph related to the history content presented in
>
> Developing History.
>
> Handout with four versions of same image (measure 3, see appendix 3)
>
> Handout with directions for ranking exercise (measure 3, see appendix 3)

Handout for half the subjects with the image, context of the image, and specific directions to crop to show a particular meaning (measure 4, see appendix 4)

Handout for remaining subjects with only the image and directions to crop *The photograph chosen for this measure needed to be rather complicated. The image contained at least two centers of interest, forcing students to decide the essential components and/or best way to convey a message through framing and cropping.

Scissors

Design

In measures 1 and 2 (the transfer measure), the study examined the effect of Developing History use on the quality of student answers. Student answers were free response and coded for quality.

Independent Variables	Measures	
	Pretest	Posttest
Before Developing History	Quality of Answer = Dependent Variable	
After Developing History		

Measure 3 (ranking measure) was designed to reveal whether Developing History benefits one population of students over another. By looking at the quality of answers on measure 3 for students who had higher than average gains on measures 1 and 2, the measure would reveal if gains were consistent over populations and measures.

Independent Variables	Measure
More gain (above average)	Quality of Answer = Dependent Variable
Less gain (below average)	

Measure 4 (context/ no context) was designed to assess whether or not students use the context or meaning of the photograph to determine the best framing of the image. Unlike the previous measures, in this measure students were provided with the meaning and asked to apply formal features. Half the students were given the context of the image and half were not.

Independent Variables	Measures
Context	Quality of Answer = Dependent Variable
No Context	

Procedure

The Pre-test: The pre-test spanned two class periods, on separate days, in the computer lab. The subjects were randomly divided in half and each group was tested on different days. On each day, the same procedure was followed.

Subjects were introduced to the experimenters and assured that there were no right or wrong answers; students were encouraged to simply do their best. Subjects were first asked to write their initials and date of birth on their paper. The experimenters explained that this would help protect their identities but also offer a way to compare their answers. All subjects were asked to view a black and white image (Olympics skiing photograph, appendix 1) projected on the white board and write their answers the following three questions: 1) what do you notice about this photograph? 2) what do you think the photographer was trying to convey with this photograph? 3) what were the choices the photographer made when composing this photograph?

The Experimenter said the questions in sequence, allowing students to respond to each question before hearing the next. The Experimenter repeated each question two times and

students were given two minutes to respond. The Experimenter encouraged students to not spend excessive time formulating complete sentences but rather write down as many of their ideas within the time frame. To encourage collaboration and active problem solving, students were then grouped in pairs based on their position in the computer lab. In both sessions, there were four groups, including one group of three. Students then progressed through the Developing History module.

In general, the students were encouraged to experience the module as a group. The experimenters remained passive observers throughout and only intervened if students were unable to problem solve a navigation stumbling block.

Post-test: The post-test occurred either 14 or 16 days later, after students returned from spring break. All 17 students participated in the post-test during one class period in the computer lab. Subjects were again asked to write their initials and date of birth on their paper. The subjects viewed the same black and white photograph (Olympic Skiing photograph) and were asked to answer the same three questions. The Experimenter followed the same procedure as the pre-test. Each question was read aloud, repeated twice, and students were given two minutes to respond.

For measure 2, students were asked to view a new, transfer photograph (Montgomery Bus Boycott photograph, appendix 2) and asked to answer the same three questions. Again, the experimenter read each question aloud and allowed two minutes for response.

To effectively execute measures 3 and 4, the subjects were divided in half based on their position in the lab. Experimenter 1 conducted measure 3 with half the students and

Experimenter 2 conducted measure 4 with the other half of students. After 15 minutes, the experimenters switched groups. The experimenters followed the same procedures for each group.

For measure 3, subjects were given two handouts. The first handout included four versions of the same image. The versions were all relatively the same size and each version was labeled with a letter, A, B, C, D. There were two vertically oriented images and two horizontally oriented images. The second handout provided the subjects with the context of the image, directions, and two questions to answer (see appendix 3 for complete text).

For measure 4, subjects were randomly divided in half. Half the subjects received handout 4a (see appendix 4) and half the subjects received a handout with the image and directions to crop. The directions read, "We only have room for half this photograph in a paper. Please cut the image to make it smaller. You can take the half from any area of the photograph (top, middle, or bottom) as long as it is rectangular shape." While each handout included the same image, handout 4a provided the story behind the photograph with specific directions to crop the image to "reflect the damage Palestinian families' suffered" and "to show how the fighting has changed their home and lives". All subjects were provided with scissors. After cutting their image, students were asked to write an explanation for their decision.

Coding

To establish reliable results, the following coding scheme to code the data was used. In an attempt to overcome biases, each experimenter coded all the responses individually and then the results were compared. When there was discrepancy, the answers were re-coded.

Measures 1 and 2: For questions 1 (What did you notice?) and 3 (What choices did the

photographer make?), one point was given for each mention of a formal feature (subject, simplicity, framing, line, angle, contrast) and half a point was given for allusions to formal features. For question 2 (What was the photographer trying to convey?), in order to distinguish answers that reflect more higher-order thinking, following scheme was used: no points were given for no responses, one point was given for answers that focused on surface level features, two points were given for answers that included inferences, and three points were given for answers that highlighted deeper meaning (recognized intent or emotion).

Measure 3: For the ranking exercise, one point was awarded for answers that ranked image A as the best representation of the specified message. In addition, a point was given for each mention of the formal features, subject, simplicity, and framing (formal features covered in Developing History module), and half a point was awarded for allusions to those formal features.

Measure 4: For the cropping activity, the same coding scheme used for the previous measures was followed. One point was given for each mention of a formal feature and half a point for each allusion to a formal feature. Given the subjective nature of the task, the subjects' ability to explain and defend their cropping decision rather than their cropped image was examined.
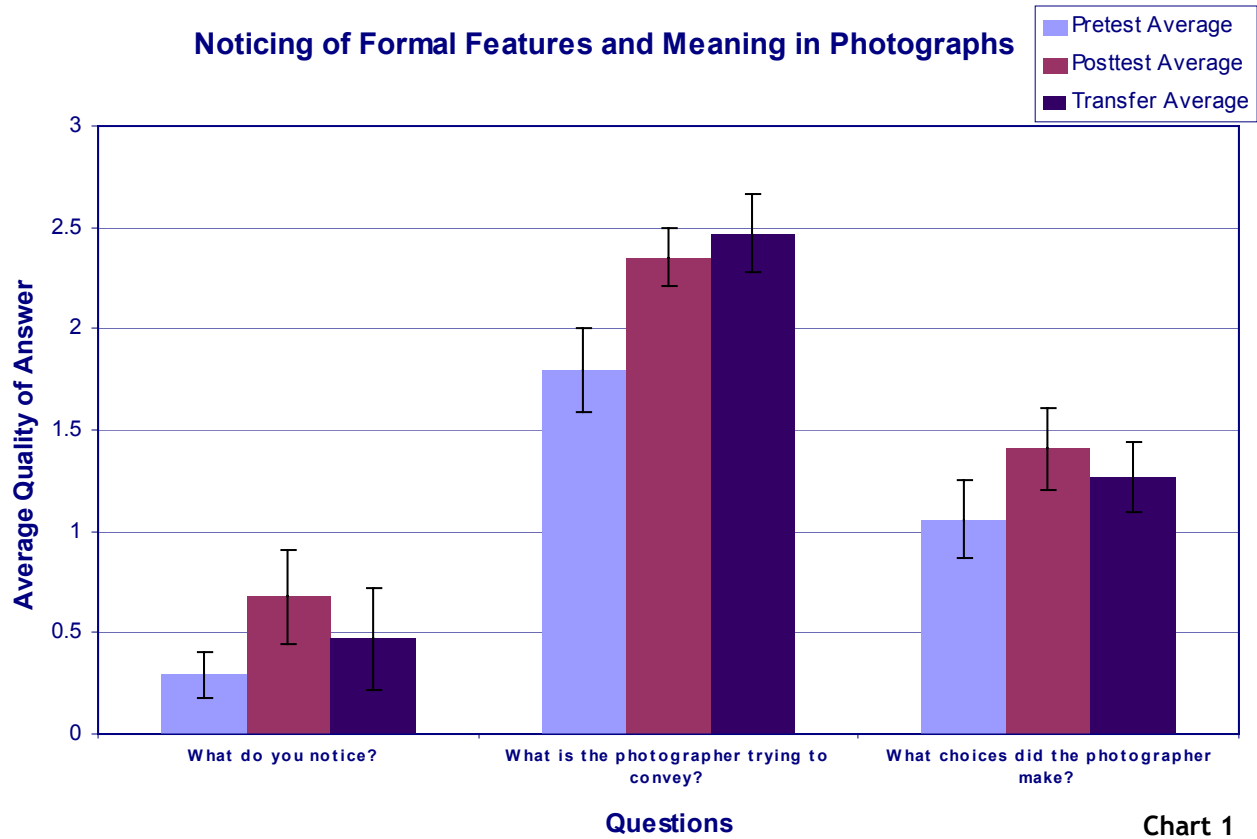
Example Responses for Coding Scheme

1 point = mention of formal features	'It is not zoomed in' 'It is contrast because there is only one person skiing and many people in the audience' 'the way it was framed…',
0.5 point = allusions to formal features	'major topic' 'what parts of the scene he should take a picture of' 'skier is very small compared to the background' 'chose to show the person's face or the nearly empty bus'

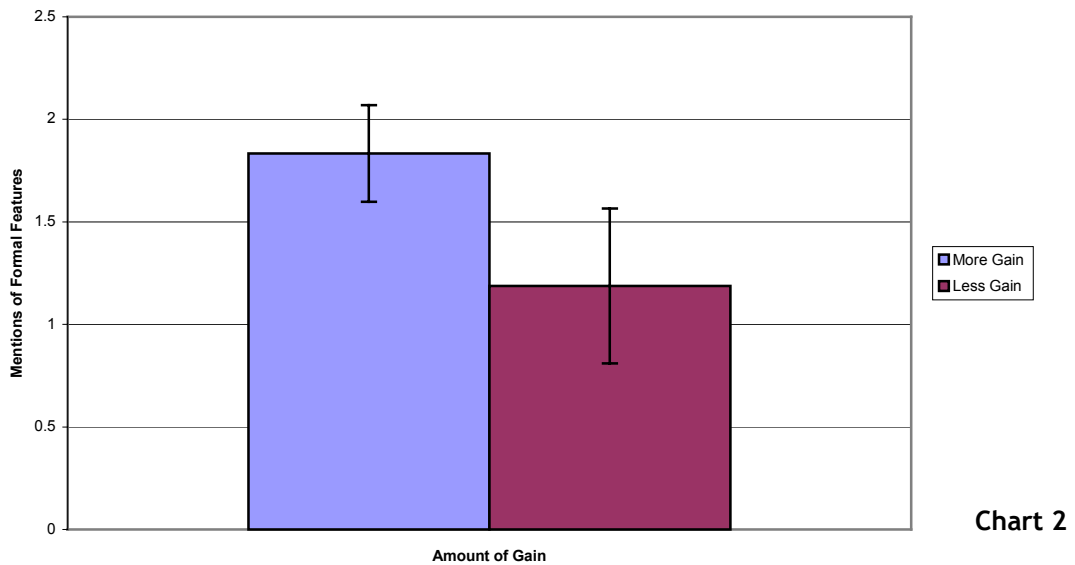| 1 point = surface level features	'Olympics' 'skiing' 'people' 'stadium' 'empty bus'
2 point = inferences	'not many people rode busses' 'a lot of people who pay to go see this kind of competition' 'a lot of people take the bus to places but you don't realize it' 'how one person can stand out' 'it is in the past'
3 = deeper meaning (recognizing intent or emotion)	'maybe you could even learn something about it' 'photographer might have been trying to show how lonely this person was' 'trying to show sadness and loneliness... the empty bus helps to show that' 'he took a picture of a woman alone to make it look gloomy'

Results

Measure 1: Overall, the results indicate that, *after* using Developing History, students

mentioned more formal features in connection with the meaning of the photograph. This is

highlighted in Chart 1. In general, a stronger improvement was noticed when the same

photograph was viewed in the post-test. Question 2 (What is the photographer trying to

convey?) is the exception, with greater gain shown for the transfer photograph. Most of the

differences between pre-test and post-test were greater than the standard error. Question 1

(What do you notice?) was the least conclusive of the three questions, with the most

overlapping occurring on the transfer photograph used in the post-test.

Noticing of Formal Features and Meaning in Photographs

Chart 1

(Chart 1: Bar chart titled "Noticing of Formal Features and Meaning in Photographs" with Y-axis "Average Quality of Answer" ranging from 0 to 3, and X-axis "Questions" with three categories: "What do you notice?", "What is the photographer trying to convey?", and "What choices did the photographer make?". Legend indicates Pretest Average, Posttest Average, and Transfer Average.)

Measure 3: The ranking measure demonstrates that gains were fairly consistent for learners.

Learners that showed more gain (above average) on measures 1 and 2 showed higher quality

answers on Measure 3.

Mention of Formal Features in Ranking Measure for Students with More and Less Gain on Measures 1 & 2

Chart 2

(Chart 2: Bar chart with Y-axis "Mentions of Formal Features" ranging from 0 to 2.5, and X-axis "Amount of Gain". Legend indicates More Gain and Less Gain.)

Measure 4: In the measure where students were or were not provided context for their cropping decisions, a small gain in quality of answer was demonstrated for students who did not receive the context of the photograph. It is important to point out that two students who were not given the context inquired about it during the study. One student asked, "Are we trying to show rich or poor people?" Another student inquired, "How am I supposed to know what this is about? I don't know what I am supposed to show." However, further study of this issue is necessary because of the small increment of gain.

Formal Features Mentioned in Cropping Justification With and Without Context

Chart 3
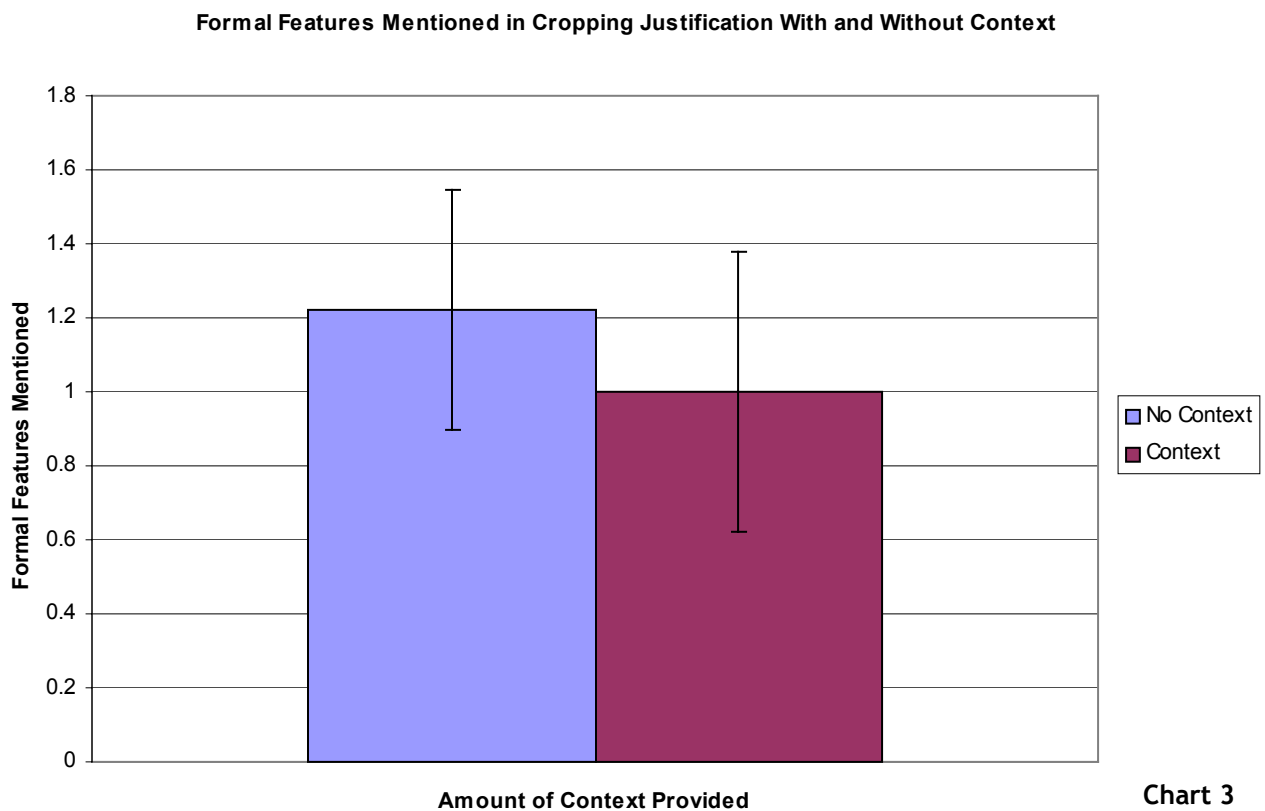
Discussion

The hypothesis that using Developing History would enable students to form stronger connections between the use of formal features and meaning in photographs was supported by the results.   In general, measures 1 and 2 showed a learning trend in that students' answers included more references to formal features in their discussion of the meaning of the

images. The results of question 2 (What was the photographer trying to convey?) showed greater gain for the transfer photograph. This anomaly may be explained by the subject matter of the image in that it was directly related to the Civil Rights Movement, the topic of Developing History. A better test of transfer might be to use an unrelated photograph or a representation from a different visual medium.

The results of measure 3 (ranking measure) suggested that some students showed marked gain while others failed to understand. Further studies need to be completed to determine why the tool succeeded in helping some students build their visual literacy while not impacting other students.

The slightly higher performance of the 'no context' group on measure 4 indicates a greater need for future study. While the difference may not be significant, the fact that the 'context' group did not demonstrate greater skill applying formal features raises some interesting questions. Did students' prior knowledge of the subject matter influence the results? Were the results a product of unequal division of skilled students? Or, was this measure not adequate to assess students' understanding?

Worth noting is the time lapse between the use of Developing History and the post-test. Not only did 14 or 16 days pass prior to the post-test, but also students were on school vacation for spring break. Greater gains might have been observed if the post-test was conducted more immediately after the use of Developing History or if students' regular routine continued during the time period between pre and post-test.

An alternative interpretation of the results could be that students acquired a newfound

interest in photography and invested time over the two weeks learning about photography and other visual literacy skills. Secondly, ARTiFACT could prompt an intuitive understanding of visual literacy. Therefore, the results demonstrated could be a product of exposure to history through photographs, not necessarily a result of the visual literacy interactions provided in Developing History.

General Discussion

Looking forward, it is apparent that both the study and the tool can be improved. The open-ended nature of the pre and post-test questions and tasks proved both difficult to code as well as challenging for students to answer, leaving too much space for students' to respond. In other words, the questions were not constrained enough to help students write focused answers, thus making it more difficult to pinpoint students' domain knowledge. Alternatively, the questions could have presented more directly, "Discuss how the formal features contribute to meaning in this photograph" or "How does the use of framing in this image show loneliness?" These questions would elicit more specific answers.

Given this was a pilot study, the next study could be more tightly designed to isolate the active ingredients of the tool and assess their effectiveness. For instance, a subsequent study could involve a control group that does not experience the Developing History module but instead is presented with essentially the same content through online text and static images. Both the control and experimental group would complete the same pre and post-test and their answers could be compared. The data would show if the interactivity made a difference in students' learning.

The subjects' enthusiasm and engagement with the tool warrants further work to improve the

learning aspect of Developing History. Based on the findings and observations during the assessment, there are specific areas to redesign. First, the visual literacy content needs to be expanded so that the concepts are presented and explored in a lucid and rich manner. Key terms need to be clearly defined and supported by multiple examples. Second, in order to build the content, more opportunities for interaction need to be integrated. The entire learning experience could be more substantial. Third, since subjects naturally requested to re-visit previous screens and images, subjects should be offered more chances to self-assess their work. For instance, students could compare their cropped image to the original. Finally, to ensure students do not overlook any key information or directions, audio should be included. During the study, it was apparent that subjects rushed through the screens that contained a significant amount of text and thus failed to read important information.

Based on the results of the study, further investigation and improvement of both the study and the tool would be valuable. The subjects interest in the topic of visual literacy and the need for this skill in today's ever-increasing visual world merits additional research and design work on ARTiFACT. Another learning assessment that more specifically tests key ingredients would help inform a redesign of the tool.

In terms of broader implications, research has shown that interactive learning opportunities are essential for conceptual art understanding and that, in order to understand, people need to see the effects of their actions on environments (Kaxzmarek & Bach-y-Rita, 1995). The tool, Developing History, and subsequent assessment of the tool in middle school classrooms could shed some light on one way to teach visual literacy skills, using technology and its capabilities for immediate manipulation and feedback as the foundation. As the need for visual literacy skills increases, the need for continued research on effective ways to teach these skills will also increase.

References

Kaczmarek, K.A. and Bach-y-Rita, P (1995). Tactile displays. *Virtual Environments and Advanced Interface Design*, W. Barfield and T. Furness, Eds. New York: Oxford University Press.

Appendix 1

Measure 1

1. View same photograph used in pretest.

    a. ldt.stanford.edu/~pagemc/artifact/Olympics

2. Answer 3 questions:

    a. What do you notice about this photograph?

    b. What do you think the photographer was trying to convey through this

       photograph? What was he or she trying to say?

    c. What were the choices the photographer made when composing this

       photograph?

Appendix 2

Measure 2

1. View a new photograph (Montgomery Bus Boycott – Boycotted Bus)

    a. ldt.stanford.edu/~pagemc/artifact/emptybus

2. Answer the same questions stated in measure 1

Appendix 3

Measure 3

1. Display 4 versions of the same photograph, varied on framing and simplicity.

2. Give students the following paragraph for context:

During the Civil Rights Movement, many people used sit-ins as a way to protest the unfair treatment of African Americans. Protestors, both African American and white, would sit at the counter waiting for service in restaurants that refused to serve African Americans. During the sit-in, protestors were humiliated, teased, and harassed by whites, unwilling to change.

Rank the images from 1 to 4 with 1 being the image that best shows the determination of the protestors and the horrible abuse they suffered.

Explain your first choice. Why did you choose this photograph? What was it about the photograph that made you pick it as the best one? Complete answers should be at least 5 lines long, but do not need to be in complete sentences.

Appendix 4

Measure 4

1. Handout copy of image to each child.

Palestinians are seen through a large hole in their living room wall as others walk through the ruins of the refugee camp in the West Bank town of Jenin April 24, 2002, where some 10% of the camp was destroyed during violent fighting between Palestinian gunmen and Israeli troops. Israel demanded changes in the composition of a United Nations team looking into its military operation in the Jenin refugee camp while a senior government official alleged that the probe was intended from the outset to cast blame on the Jewish state.