The Role of Emotion in Teaching and Learning History: A Scholarship of Teaching Exploration

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IT IS IRONIC that visuals are so integrated into postmodern American culture, and yet history instructors still seem so uncomfortable with them, evidently preferring written texts over visual ones.[1] Today there exists what historian Louis P. Masur has called a "ubiquitous visual culture" where image and reality and authenticity are difficult to decipher.[2] Perhaps this is the reason students often want to believe that photographs capture things the way they really are. The great American photographer Lewis Hine famously cautioned, "while photographs may not lie, liars may photograph," an admonition to the scholar and the layperson alike to take the time to learn to "read" a photograph.[3] Throughout the past century, society has been transformed by the democratization of the film and video camera, the popularity of movie and television cameras, and the development of the computer's digital media. Because all images offer both a representation and an interpretation of reality, as such, they are important—indeed, *crucial*—glimpses into the past. As historians Joshua Brown and Lou Masur and other scholars such as Katherine Martinez have been reminding their colleagues for some time, historians and others in the humanities must become more comfortable teaching with images and engaging students in the art of visual literacy. Images must be processed, integrated, and interpreted by students as much as history professors.[4] Recent evidence suggests this is

happening—although slowly. Sam Wineburg's book, *Historical Thinking and Other Unnatural Acts* (2001), has been influential in raising pedagogical awareness among historians, and one recent article in the *Journal of American History* describes the evidence a group of historians is amassing on "how historical thinking with visual arguments *develops*" in their students, situating their inquiry in a scholarship of teaching approach.[5]

Historians who advocate the analysis of images speak clearly, loudly, and uniformly on one point: they urge instructors to move beyond using images merely as presentational gimmicks to engage students and rather as the source of (potentially new) historical interpretations, arguments, and understandings.[6] We believe that visual evidence must come from the margins to the center of historical inquiry due to the value images have in terms of memory and long-term learning. We also acknowledge that history is not something one "memorizes," and therefore we sought to examine how particular images relate to content knowledge and, in turn, to historical thinking. Our endeavor stems from a historian's particular question to two psychology colleagues regarding scholarship of teaching about the role of *emotional images* in student learning. In this paper, three scholars—a historian, a biopsychologist, and a cognitive psychologist—report on a collaborative experiment they conducted to measure student retention of historical information, with emotional images being the crucial research variable. While images were not necessarily the focus of interpretation for students, they were valuable catalysts to engagement and, ultimately, learning.

Historians are often uncomfortable thinking about the role of emotion, sometimes recalling the ways that emotions have been exploited by unscrupulous political leaders at various times in the past. If this is one extreme, however, the drone of a lecturing professor without images or without, well, emotion or passion in a large lecture hall might be the other. There must be a middle ground. Historian Peter J. Frederick highlights a Native American medicine wheel in his classes to make the point to students that one must use one's heart as well as head when studying—and learning about—the past.[7] The historian in our group began asking questions about images, emotion, and learning. In response to the question, "Does using emotionally powerful images in class help students connect to the history we discuss and interpret?" the two psychology colleagues stated, "Well, this is an empirical question. We could test it." Intuition notwithstanding, we decided to conduct an experiment with students, and our results, apart from being perhaps a rare example of interdisciplinary collaboration between the humane and behavioral sciences, are relevant to teachers not just of history but of other humanities and social sciences disciplines, and even to publishers of textbooks.

Further conversations among the three of us about experimental design

produced three hypotheses. The first hypothesis was that a memory task incorporating emotional images (as opposed to either no images or emotionally "neutral" images) would result in the best text recall; we know from psychology literature that a person has better memory recall with images than without them.[8] Often referred to as the *picture superiority effect*, psychological explanations for this phenomenon are twofold. One explanation, called the *dual coding hypothesis*, posits that people's memory systems store information in multiple codes. Pictures encourage information to be stored as both image-based mental representations and in verbal form, perhaps as a set of propositions based on the image. In contrast, text is less likely to encourage multiple forms of coding. When a person wants to recall information first learned through images, there are multiple pathways or cues that lead to the memory, resulting in greater accessibility of that memory. Another explanation, one that is perhaps more relevant to the present study, is called the *relational-organizational hypothesis*.[9] In this view, images help people form and understand relationships, or links, among pieces of information. The more links a given piece has to other pieces, the better it will be recalled.

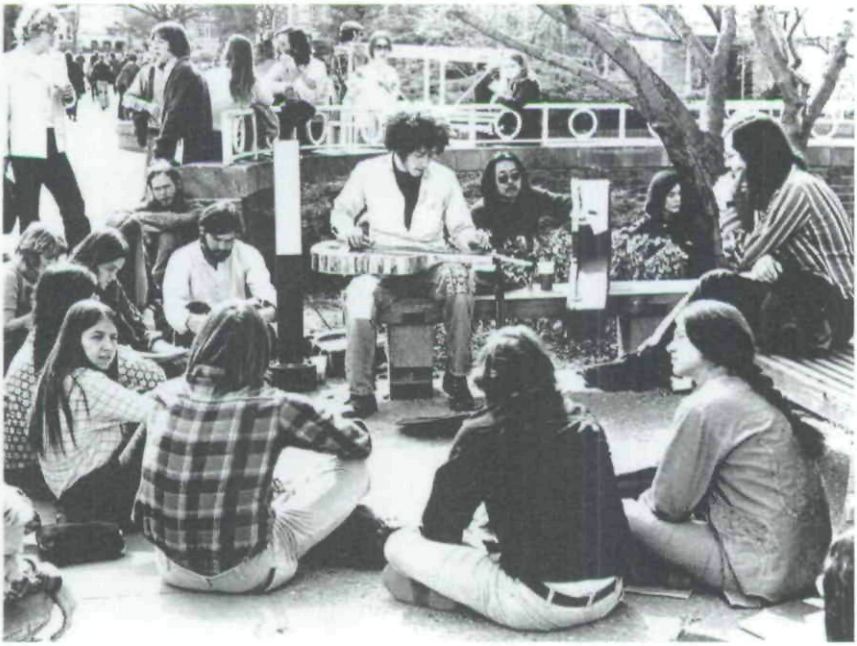
Past psychological experimentation also indicates that emotional events create more vivid memories; in the words of two psychologists in a recent article, "Converging evidence from autobiographical memory studies, animal and human laboratory studies, and brain imaging studies shows that emotional events are remembered better than nonemotional events and the mechanisms specific to emotion underlie these effects."[10] An extreme example would be "flashbulb memories," such as remembering where one was when John F. Kennedy was assassinated, or what one was doing when news of the events of September 11, 2001, first broke.[11] Other studies confirm that emotional memories tend to be long-lived, vivid, and detailed; "Emotion," two scholars conclude, "appears to increase the salience of information much like a highlighter increases the salience of text. In short, emotion makes memory better."[12]

The question behind this first hypothesis, however, was different from most of the psychological experimentation previously conducted:[13] our crucial question asked if the emotional image also created better memory for *associated* material as well, and not just for the actual image itself. In other words, we were seeking to use an emotional image (happy, sad, disturbing, inspiring, etc.) to enhance a student's memory of some content information that followed. Much less research has examined this idea, and we anticipated one of two possibilities—the emotional images would either heighten arousal and attention that then would carry over to enhanced retention of content material, or they would hinder memory of surrounding content material due to what is called the von Restorff effect.[14]

Emotional image: Above, Mary Ann Vecchio, just 14 at the time, cries out after Jeffrey Miller, aged 20, had been shot on May 4, 1970, at Kent State University. The photo by John Filo won the 1971 Pulitzer Prize. ©1970 John Paul Filo; used with permission.

The second hypothesis involved actually testing for the emotional value of the images in question. Do the images actually induce real emotional responses in students when presented in the context of academic material? This question, too, could be tested empirically by looking at the physiological responses of those viewing the images; if an image were in fact "emotional," then it should invoke a different physiological response from a person viewing a "neutral" image. In psychology, the assumption is that emotion consists of two things: physiological arousal and a cognitive label (e.g., "this image is 'happy' or 'disturbing'").[15] Such a test was important because we needed to have a check that we did, in fact, invoke emotion in the participant with the images; we did this by measuring arousal through heart rate and galvanic skin response (GSR), or sweating.

The third hypothesis involved personality type, with the assumption that open- or closed-mindedness (openness is one of the "Big Five" personality traits[16]) would come into play with the task assigned—in this case, a recall quiz about historical content related to the 1960s. For example, if a participant is relatively closed-minded and is presented with emotionally provocative images, the resulting arousal could cause the participant to shut down, therefore resulting in poor performance on a quiz afterward. On



Neutral image: A group of young people in the 1960s. Photographer unknown. From the Kenneth Spencer Research Library, University of Kansas; used with permission.

the other hand, such images might also serve to strengthen one's memory by enhancing arousal and attention. A personality type assessment was given to each participant to determine one's openness.[17]

With three hypotheses in mind, the experiment went as follows. We asked each of the 20 students in Lori Schmied's biopsychology class to rate approximately 100 images Chad Berry had gathered from the 1960s for their emotional content on a 7-point scale (with 1 signifying lowest and 7 signifying highest emotional content). Based on their responses, the twelve lowest-rated images (at or near 1) were classified as neutral, and the twelve highest-rated images (at or near 7) were classified as emotional; these 24 images became the visual stimuli for our experiment. Once we arrived at the set images from the 1960s, we created twelve pairs of emotional/neutral images, such that both the images in a pair were consistent with a given topic. For example, the following content:

> As young people moved into adulthood, they discredited the sources of fulfillment of their parents' generation, who sought materialism and family and conformity. Instead, '60s' youth turned to alternate sources for fulfillment, including music, non-Western religion, nonconformity, protest, even altered states of consciousness through drug use.

Emotional image: Detail of John F. Kennedy, Jr., saluting his father's casket. From Corbis; used with permission.

was applicable to two images, an emotional one (the famous Kent State photo by John Filo minutes after the National Guard began firing) and a neutral one (a photo of a group of college students sitting in a circle, outdoors, listening to another student playing the guitar).

Neutral image: A scene from Camelot. From Corbis; used with permission.

Another pair contrasted the famous photo of John F. Kennedy, Jr., saluting at his father's funeral (the "emotional" image) against a closeup of Richard Burton and Julie Andrews from *Camelot.*

Next, we created conditions for the experiment. In condition 1, no im-

ages were presented at all. In this condition, rather than displaying an image on a computer screen to a participant, we displayed a blank screen for 20 seconds, followed by text (participants could not advance the program manually). Condition 2 used neutral images; each image was displayed for 20 seconds, followed by the corresponding text. Condition 3 displayed the emotional images for 20 seconds, followed by the text. In all conditions, the text was exactly the same (the only change was in the images), the image or blank screen remained for 20 seconds, and the participant's reading was self-paced—when a participant finished reading, he or she pressed the computer's space bar to proceed—either to a new image for 20 seconds or a blank computer screen for 20 seconds.

Once the participant read the twelve pieces of content, an openness questionnaire was administered. In addition to providing information relevant to our third hypothesis on personality type, the questionnaire also served as a distracter task, so that any short-term memory for the final readings would be lost (findings reveal short-term memory without rehearsal lasts only about 20 seconds). The participants were also self-paced for this questionnaire as well. Lastly, a surprise, 10-question, multiple-choice quiz, developed by cognitive psychologist Chad Schrock, was given over the *reading material* (again, not the images) from the experiment. Sixty-three students participated in the experiment.[18]

While there was a surprise or two, most of our hunches were supported, including hypothesis 1: the emotion group did indeed have the highest recall, and the results were statistically significant.[19] The next most successful group was the text-only condition, followed by the neutral-images condition. We anticipated that the emotional-images condition would score the highest, but we were initially surprised at the text-only group scoring better than the neutral-images group. Our interpretation is that the neutral images proved, at best, not to be an enhancement to learning, and at worst, became a distraction to learning.

Such a finding has relevance both to teaching and learning. The most obvious thing that comes to mind is textbook images. Compared to those in other disciplines, the images in history textbooks often appear to be neutral or without much emotion, even in texts covering the twentieth century. For comparison, one need only look at images in a psychology or sociology or anthropology text, which are often quite provocative and laden with emotional underpinning. One wonders about the difference. Is it because the discipline of history has been so traditionally textual? Is it because illustrations are a relatively recent addition to history texts? Do editors and publishers feel limited by available visual evidence? Are they not looking hard enough or diligently enough? Or with heightened politicization of the study of history, is it because history publishers do not want

to offend, particularly in the big-state markets? Is it because some history text authors fail to think actively and mindfully about images as they write the narrative, leaving instead image selection to an editor? As a professor of history, Berry's hunch is that the plethora of special features in texts (shaded sections, illustrations, tables, etc.) have always had a "skip-me" message to students, especially because images are so seldom integrated with the text.[20] But our research with emotional images suggests that "neutral" images may not just be skipped by students, they may also be a *distraction* to learning. Lou Masur's plea to textbook authors to take images more seriously now has added weight. We believe that such a finding suggests a need to rethink the way images are presented in history texts.

For hypothesis 2, recorded heart rate results aligned with our predictions, though not with statistical significance. However, our GSR (sweat response) predictions were confirmed: the emotion condition had the most activity in GSR, followed by neutral and then text conditions. These results support the idea that it is the emotional aspect of the images that helped with memory (and indeed that Lori Schmied's students had in fact designated emotive images).

For hypothesis 3—concerning openness—the hunch was also supported; those with low openness in the emotional group had by far the best scores on the quiz, strongly suggesting that emotional arousal helped them to remember content. The next highest group was the high openness in the text category, perhaps because students in this group are open to information and do not necessarily need to be hit over the head with a stimulus. Again, detractors should note two things: first, participants were not told they would be quizzed, and second, administration of the openness questionnaire helped eradicate short-term memory effects.[21]

All of these findings support the idea that emotionally provocative images can enhance memory retention of related historically-based content. Certainly, many teachers already know the value of emotions in learning. How many teachers will use a cartoon image to invoke humor to drive home a point? Others may tell an emotional story for an affective result. The thing to keep in mind here is that by *emotional*, we do not necessarily mean *disturbing*; rather, there are many different types of possible emotions in any particular emotive image.[22] To qualify as "emotional," psychologists are assuming two very important things occur: a physiological arousal combined with cognitive labeling or evaluation that gives that experience an affective quality.

First, arousal: the physiological arousal is virtually the same, regardless of whether the emotion is positive or negative. If there is no nervous-system arousal, then we cannot say there is an emotion. When we selected the stimuli, we did so using an inter-rater method: we had several (*i.e.,* 20)

"judges" rate 100 images for their emotive quality. We then selected 12 from both extremes, positive and negative, which received the highest and lowest ratings from 100 percent of the judges. During the experiment, we monitored physiological responses so that we were able to confirm that the images produced the arousal necessary to qualify the experience as "emotional." To summarize: an emotional image elicits arousal (and thus increases attention); a neutral image does not. That does not mean that we do not attend to neutral stimuli, but rather that in the case of the emotional image, the instructor has enhanced the learning process—students have to expend less cognitive effort to learn the material.

Second, cognitive labeling or evaluation: some emotions are probably elicited with very little cognitive evaluation—for example, disgust at a picture of rotten meat, fear at the image or presence of a spider or snake, etc. The emotional valence of these images is probably accounted for by some combination of associative learning and biological preparedness. On the other hand, why should the Kent State photo reliably elicit an emotion? A cognitive evaluation theory would claim that the human capacity for empathy is central for creating an emotional reaction to these kinds of images. In some way, we see the people portrayed in these images as ourselves; that their plight is our own. By stepping in their shoes, our emotional response is to feel what they are feeling (anger, fear, happiness, etc.). So, we go to a movie, identify with the characters, and begin to feel their happiness or sadness. We go to a football game and are elated or crushed (depending on which team we identify with) by the results. Cognitive evaluation may be a theoretical term for why role playing can be a powerful learning experience in the history classroom.

Therefore, we can give some rough outlines about how to evaluate the possible emotional content of an image. First, it needs to depict someone in a circumstance that would likely evoke an emotional reaction (a person at a funeral, person being harassed by a dog, a young child in a tender moment—the possibilities are limitless), and second, the viewer of the image needs to somehow be able to identify with the people and circumstances in the image. Thus, an evaluation of the emotional content of the image is not based on the image alone; also important is the relationship between the image contents and the viewer of that image. For example, imagine two fans from rival schools watching a sports contest with a person who cares little for sporting events overall. When one team wins in the final seconds of the game, it is possible to have three different emotional responses to the same event. Our images in the study elicit emotional responses from the participants because they portray people in emotionally-charged situations, and our participants could identify with the people in the images—as college students, as Americans, as global citizens, as fellow human beings.[23]

The real question then becomes, why and how do emotional images enhance learning? Two approaches, not mutually exclusive, can help explain this. The first comes from physiological theory, which suggests that the adrenaline release evoked by an emotional stimulus helps forge the neural pathways that underlie memories. The second comes from a cognitive perspective: Bower's relational-organizational hypothesis would predict that the emotional images "set the stage" for the related text, creating a strong association between an emotionally charged, and thus memorable, image (based on the physiological links between emotion and memory) and related concepts from the text, making those textual concepts more accessible. As Bower's work demonstrated, the more links (he referred to them as "hooks") a piece of information has to other pieces of information in memory, the better the chances that the information will be accessible. Think of this as facilitating more alternative pathways to a given point.[24]

Another important thing we know about memory is based on the work of Sir Frederick Bartlett more than sixty years ago.[25] His classic experiment involved having college students read a Native American folk tale and then testing their recall. He discovered that each time students tried to remember the tale, they botched it, often embellishing it with their own experience, and sometimes even adding a moral to it. He then theorized that memory is enhanced when it fits within an existing cognitive structure based on prior knowledge and experience. Another experiment involved giving a long list of arcane steps to participants and asking them to recall the information. Few people could. But when participants were told the list was about washing clothes, they had a much easier time remembering it because the brain could call on experience to help it remember.[26] Similarly, the pictures we gave participants helped set the stage for the content that was to come. In educational theory, the pictures serve as the pedagogical set for what is to come; after the set, students are "primed" for the content.[27] In our experiment, for example, viewing the famous picture of a Birmingham fireman aiming a water hose powerful enough to tear bark off trees at civil rights protesters (surely an "emotional" image) perhaps prompted the student to call to mind a number of things (for example, conversations about and experiences with race, movies about the 1960s or the civil rights movement, music, experiences with injustice, etc.).

Eventually, Bartlett's work led to what is known as schema theory.[28] Whenever we are presented with new information, we attempt to activate a prior schema—or what may be better understood as clusters of knowledge and experiences—so as to make the new information easier to integrate. With arousal (again, this is the physiological manifestation of being presented with emotional images) and attention (the cognitive component)

from an emotional image in our experiment, the viewer was likely thinking about what he or she was seeing as well as what was known; the person was engaged and ready to know more, and after the 20 seconds, the content followed. Once presented with the text, the participants read it more deeply and, as the quiz scores show, likely did more elaborative processing–an action that cognitive psychologists believe facilitates more long-term memory results.[29] Without guidance, when an image is projected in class to students not just as a pedagogical "appetizer," but rather as the "main course," they view it, and—coming from a "visual" culture confident about their ability to analyze an image almost instantaneously—having looked at it for five or ten seconds, they are ready to move on. When prompted to look at it more deeply, however—often being asked a standard set of questions about the image—students engage much more deeply in what might be called this elaborative processing. In this occasion, images are able to facilitate analysis of new interpretations, arguments, understanding, and, sometimes, additional questions. For example, students could be asked some of the following questions to get at a deeper level of image analysis:

1. Where did your eye go first? Then where? And after that? Think or write about why this happened.

2. Would you describe the image as simple or busy? How does this affect the journey your eye took in question 1?

3. Where is the light coming from? How can you tell? If this is an outdoor image, what time of day might it be? Which are the brightest parts of the image? The darkest parts? How do the answers to these questions about light affect the mood of the image?

4. Which parts of the picture are sharply in focus? Which parts are softer or out of focus? How does this affect the way you look at the image?

5. Look harder at the image. Concentrate on it. List some of the details you might not have noticed at first. Include information about people, places, and things and nature, including the climate or the weather.

6. How do the answers to question 5 help you know where and when the image was taken? What do they tell you about the people in the image?

7. Where is the photographer/creator of the image? Is he or she above, below or at the same level as the subject of the picture? Is he or she near or far away? What kind of information do you get because of the creator's perspective on the subject?

8. Keeping all these things in mind, if you had to write a caption that expressed in one or two sentences what this image is about, what would you say? What does it say about history/literature/etc.?

9. In your opinion, why did the creator want you to see this image?[30]

The participants with neutral images, on the other hand, had a more difficult time remembering the content information because the images did not enhance the arousal and hence the attention in the mind of the participant. Therefore, without arousal and attention, there was no real way to activate the participant's schema. If one cannot activate the schema, there will not be as much deep encoding of the material that follows.[31]

There is a good possibility that the different conditions from the experiment encouraged different kinds of memories about the text, which is really the underlying motivation for the study in the first place, and an important thing to keep in mind as a pedagogical application based on the experiment's outcome. It is probably not the case, for example, that the three groups differ simply on how well they can recall the same material (*i.e.,* same memory, different recall levels). Rather, it is likely each group encoded the material differently to start with, and this in turn influenced how memorable that experience was.

In 1970, two psychologists proposed a principle of memory called *encoding specificity,* the claim being that the kind of memories one creates are dependent on the contexts in which one forms them and include information about those contexts as part of the memory.[32] We found evidence that the pictures enhanced performance on a multiple-choice test. While this is interesting, from a pedagogical viewpoint, it only indirectly addresses the big question: did we enhance, maybe deepen, students' understanding of the material? After all, test performance really is not the goal; it is just the diagnostic for checking on how well a student understands the material. For those people in the picture condition, do they perhaps have a more complete understanding and appreciation for the 60s than the other participants who read the same thing without the pictures? Our guess is yes, although future studies could test that idea more explicitly. For example, would the groups show differences in writing an essay about their understanding of the 1960s, a format that would better measure their underlying organization of the subject? Our bet would be they would, with the emotional picture group demonstrating a richer and more coherent knowledge of the material as a whole.

For teachers of history in particular and the humanities in general, the challenge is to branch out beyond the dispassionate and the textual. The question is not so much why we once assumed that learning can be achieved solely through the text, but rather why, in the face of contrary evidence, we continue to rely on methods that are often ill-suited to teaching and learning. Today, multimedia instruction is widely available, and even though admittedly it is not always a better tool, it can at least introduce more formats to students: images, either still or animated; sound of all kinds; and a world full of archives available at a click. Some students, prompted by

their instructors, are already using this new media to create engaging and effective historical interpretations, particularly through digital storytelling, sometimes referred to as multimedia narrative.[33] After all, the new histories that the last forty years have provided should be matched with new teaching. Lou Masur notes that his most satisfying teaching occurs when he brings an image to class and asks students to process it. Sam Wineburg is more blunt, describing the "moments of confusion before an interpretation emerges, while indecision and doubt reign and coherence remain elusive."[34] Perhaps because of this experiment, we are getting closer to knowing why such a pedagogical model is satisfying for the instructor and effective for the learner. To apply the results of this experiment need not take an instructional revolution. As Masur explains, "I frequently interrupt the discussion to provide historical information, to sort through interpretations, to connect text and context, past and present."[35] Exactly. And with some care in image selection, we now believe that even deeper learning will occur.

Notes

1. The authors would like to thank Marcia Keith for her helpful insights and support. Helpful comments were also given by Todd Zakrajsek, Peter Frederick, and Wayne Messer.

2. Louis P. Masur, "'Pictures Have Now Become a Necessity': The Use of Images in American History Textbooks," *Journal of American History* 84 (March 1998), 1422.

3. Hine was also famous for quipping, "If I could tell the story in words, I wouldn't need to lug around a camera."

4. "I have lost track of the occasions when I have encountered skepticism toward the idea that the visual may illuminate a discourse never expressed—or expressed incompletely—in text." See Joshua Brown, "Toward a Metting of the Minds: Historians and Art Historians," *American Art* 17 (Summer 2003): 4-9; also see Louis P. Masur, "Reading Watson and the Shark," *New England Quarterly* 67 (September 1994): 427-54; Katherine Martinez, "Imaging the Past: Historians, Visual Images, and the Contested Definition of History," *Visual Resources* 11 (1995): 21-45.

5. Sam Wineburg, *Historical Thinking and Other Unnatural Acts: Charting the Future of Teaching the Past* (Philadelphia: Temple University Press, 2001); Michael Coventry, Peter Felten, David Jaffee, Cecilia O'Leary, and Tracey Weis, with Susannah McGowan, "Ways of Seeing: Evidence and Learning in the History Classroom," *Journal of American History* 92 (March 2006): 1377; also see Lendol Calder, William W. Cutler III, and T. Mills Kelly, "History Lessons: Historians and the Scholarship of Teaching and Learning," in *Disciplinary Styles in the Scholarship of Teaching and Learning: Exploring Common Ground*, ed. Mary Taylor Huber and Sherwyn Morreale (Washington: American Association for Higher Education, 2002) and http://www.ashp.cuny.edu/nmcprograms.shtml.

6. See Coventry, et al., "Ways of Seeing," 1375.

7. Also see Peter J. Frederick, "Is Someone in the Classroom with Clio?" *The History Teacher* 5 (January 1972): 7-19.

8. See, for example, A. Paivio, "Mental Imagery in Associative Learning and Memory," *Psychological Review* 76 (1969): 241-63; D. L. Nelson, U. S. Reed, and J. R. Walling, "Picture Superiority Effect," *Journal of Experimental Psychology: Human Learning & Memory* 2 (1976): 523-28.

9. G. Bower, "Imagery as a Relational Organizer in Associative Learning," *Journal of Verbal Learning and Verbal Behavior* 9 (1970): 529-33.

10. Quoted in Linda J. Levine and David A. Pizarro, "Emotion and Memory Research: A Grumpy Overview," *Social Cognition* 22 (2004): 535; also see M. A. Conway, *Autobiographical Memory: An Introduction* (Philadelphia: Open University Press, 1990); and D. B. Pillemer, E. D. Rhinehart, Daniel Reisberg, and Friderike Heuer, "Memory for Emotional Events," in *Memory and Emotion,* ed. Daniel Reisberg and Paula Hertel (New York: Oxford University Press, 2004), 3-41; and S. H. White, "Memories of Life Transitions: The First Year in College," *Human Learning* 5 (1986): 109-24.

11. R. Brown and J. Kulik, "Flashbulb Memories," *Cognition* 5 (1977): 73-99; Friderike Heuer and Daniel Reisberg, "Vivid Memories of Emotional Events: The Accuracy of Remembered Minutiae," *Memory & Cognition* 18 (1990): 496-506; U. Neisser and N. Harsch, "Phantom Flashbulbs: False Recollections of Hearing the News about *Challenger*," in *Affect and Accuracy in Recall: Studies of "Flashbulb" Memories,* ed. E. Winograd and U. Neisser (Cambridge: Cambridge University Press, 1992), 9-31.

12. Quoted in Levine and Pizarro, "Emotion and Memory Research," 537; also see J. E. LeDoux, "Cognitive-emotional Interactions," in *Cognitive Neuroscience of Emotion,* ed. R. D. Lane and L. Nadel (Oxford: Oxford University Press, 2000), 129-55.

13. For example, a recent experiment conducted a PET-scan study that asked participants to view four types of pictures: positive, negative, neutral, and neutral but interesting. A month later, they were given a surprise recognition test, and the results showed that both emotional and interesting pictures were remembered better than neutral ones. See S. B. Hamann, T. D. Ely, S. T. Grafton, and C. D. Kilts, "Amygdala Activity Related to Enhanced Memory for Pleasant and Aversive Stimuli," *Nature Neuroscience* 2 (1999): 289-93. Also see Paula Goolkasian, "Pictures, Words, and Sounds: From Which Format Are We Best Able to Reason?" *Journal of General Psychology* 127 (October 2000): 439-60; and Elizabeth A. Kensinger and Suzanne Corkin, "Memory Enhancement for Emotional Words: Are Emotional Words More Vividly Remembered than Neutral Words?" *Memory & Cognition* 31 (2003): 1169-80.

14. Named after Hedwig von Restorff, the situation occurs when one object stands out "like a sore thumb" and is therefore remembered more easily than surrounding things. But in this case the "sore thumb" might be the emotional image, and the content material might be less well remembered because one's attention was so focused on the image. See Hedwig Von Restorff, "Über die Wirkung von Bereichsbildungen im Spurenfeld" (The effects of field formation in the trace field), *Psychologie Forschung* 18 (1933): 299-34.

15. S. Schachter and J. Singer, "Cognitive, Social, and Physiological Determinants of Emotional State," *Psychological Review* 69 (1962): 379-99.

16. R. R. McCrae and P. T. Costa, "A Five-Factor Theory of Personality," in *Handbook of Personality: Theory and Research*, ed. L. A. Pervin and O. P. John (New York: Guilford, 1999), 139-53.

17. O. P. John, E. M. Donahue, and R. L. Kentle, *The "Big Five" Inventory, Versions 4a and 54* (Technical Report) (Berkeley: Institute of Personality Assessment and Research, 1991).

18. We made sure that no participants had had a history course with Chad Berry, given his own classroom emphasis on visuals and visual literacy.

19. In scientific research there is a standard for deciding whether an effect is truly due to the manipulation that one has done or if it is simply due to chance. The standard is less than a probability (p) of <.05 (meaning that there is less than five in one hundred chances that it was purely chance). Our standard was at p=.02. For more information, see G. W. Heiman, *Understanding Research Methods and Statistics,* second ed. (Boston: Houghton Mifflin, 2001).

20. Masur argues that the reason is that textbook authors do not choose photographs. Masur, "'Pictures Have Now Become a Necessity,'" 1412.

21. We have discussed how interesting it would be to quiz the participants again six months later.

22. One recent review, however, suggests that different emotions have different effects on memory. See Levine and Pizarro, "Emotion and Memory Research," 530-54.

23. For more on this discussion, see Richard S. Lazarus and Bernice N. Lazarus, *Passion and Reason: Making Sense of Our Emotions* (New York: Oxford University Press, 1994), 116-36.

24. Bower, "Imagery as a Relational Organizer in Associative Learning," 529-33.

25. See *Remembering: A Study in Experimental and Social Psychology* (Cambridge: Cambridge University Press, 1932).

26. See R. Reed Hunt and Henry C. Ellis, *Fundamentals of Cognitive Psychology,* 6th ed. (New York: McGraw-Hill, 1999), 232.

27. Madeline Hunter pioneered the notion of set. See Madeline Hunter, *Mastery Teaching: Increasing Instructional Effectiveness in Elementary and Secondary Schools, Colleges, and Universities* (Los Angeles: Corwin Press, 1994). See also Mary Furlong, "A Lesson Design in Six Steps," *Social Studies Review* 25 (Spring 1986): 36-38.

28. See Hunt and Ellis, *Fundamentals of Cognitive Psychology,* 229-35.

29. See F. I. M. Craik and E. Tulving, "Depth of Processing and the Retention of Words in Episodic Memory," *Journal of Experimental Psychology* 104 (1975): 268-94.

30. These questions were originally developed by Stan Brimberg, Bank Street School of Education; they have been modified by Chad Berry.

31. The results for the no-picture (text only) condition were initially surprising; however, after interviewing several of the participants, our best guess is that we inadvertently set up what is called a contrast, or Von Restoff, effect (see note 14 above). Participants interviewed commented that they found the 20-second blank screen preceding each text mildly irritating (20 seconds feels like an eternity when there's nothing happening), and this may have focused their attention on the text when it did appear. Another explanation has to do with an inherent advantage for this group in integrating the text into long-term memory. By giving them a 20-second blank screen after each text, rather than an attention-capturing picture, we gave them valuable time to ruminate on the text.

32. D. M. Thomson and E. Tulving, "Associative Encoding and Retrieval: Weak and Strong Cues," *Journal of Experimental Psychology* 86 (1970): 255-62.

33. See Coventry, et al., "Ways of Seeing," esp. 1396-1401.

34. Wineburg, *Historical Thinking and Other Unnatural Acts,* 91.

35. Masur, "'Pictures Have Now Become a Necessity,'" 1423.