Media Arts: Arts Education for a Digital Age

KYLIE A. PEPPLER

Indiana University, Bloomington

Background/Context: *New technologies have been largely absent in arts education curriculum even though they offer opportunities to address arts integration, equity, and the technological prerequisites of an increasingly digital age. This paper draws upon the emerging professional field of "media arts" and the ways in which youth use new technologies for communication to design a 21st-century K-12 arts education curriculum.*

Description of prior research on the subject and/or its intellectual context and/or policy context: *Building on sociocultural theories of constructionism as well as Dewey's theories of the arts and aesthetics as a democratic pedagogy, this study draws upon over three years of extensive field study at a digital design studio where underprivileged youth accessed programming environments emphasizing graphics, music, and video.*

Purpose/Objective/Research Question/Focus of the Study: *This study documents what youth learn through media art making in informal settings, the strengths and limitations of capitalizing on youth culture in media art production, and the distinct contributions that media arts education can make to the classroom environment.*

Research Design: *A mixed-methods approach was utilized that analyzed data from participants and professional interviews, an archive of youths' media art, and videotape documentation of youth at work on their projects.*

Conclusions/Recommendations: *Findings point to the ways in which youth engage with technology that encourages active learning and how new types of software can be used to illustrate and encourage this process.*

It almost goes without saying that youth spend an extraordinary amount of time reading and writing new media (Rideout, Roberts, & Foehr, 2005), as evidenced by the proliferation of media texts found on

Teachers College Record Volume 112, Number 8, August 2010, pp. 2118–2153

0161-4681

MySpace, YouTube, or Facebook. One might go so far as to speculate that, in today's society, public engagement with websites like Flickr.com is probably more widespread than traditional types of arts experiences, like creating sculptures or darkroom photography. Assuming that this is true, arts education, and more specifically, media arts, has many insights to offer about engaging with this new medium in a critical, communicative, and expressive manner. The emergent field of "media arts" (also called digital arts or new media) can especially provide insights into how this could operate in the K-12 schooling curriculum. The professional field of media arts encompasses all forms of creative practice involving or referring to art that makes use of electronic equipment, computation, and new communication technologies (Muchnic, 2005; Poissant, 2005). Beyond surface forays into technology (such as typing, word processing, and web surfing), media art encourages designing, creating, and critiquing genres that connect to youth culture and engage youth in the process of learning more actively than what is traditionally offered in schools, especially in marginalized communities.

In recent years, there has been a growing commitment to educating learners with diverse needs, especially in underprivileged communities, as evidenced by the number of policy efforts attempting to address this issue (No Child Left Behind [NCLB], 2002). However, the ways in which these policy efforts have been translated into practice have oftentimes meant the adoption of narrowly technical, scripted curricula that focus on the fundamentals of reading and mathematics (see, for example, the Open Court curriculum, Hirshberg, Bereiter, & Hughes, 1989). This narrows the opportunities to connect to the diverse interests of youth as well as fails to connect to youths' out-of-school identities. What has resulted is an astonishing dropout rate of low-income and minority youth by the time they reach high school (Oakes, 2005). While there are several explanations for this widening educational gap, what is needed is a way for current curriculum objectives to connect to youth culture and actively engage them in learning while preparing youth with critical 21st-century learning skills that extend beyond traditional types of literacy. In fact, learning theories like constructivism and constructionism assert that all new knowledge is constructed from preexisting knowledge, which points to the central role that youth culture could potentially play in the reenvisioning of the school culture (Papert, 1980, 1993). Because media arts draws heavily on youths' existing interest in new media, it can potentially be an effective way to enhance the connection between school and out-of-school learning and act as a tool for active learning (Brown, 1988; Bonwell & Eison, 1991). Furthermore, viewing creative digital production with new media from the perspective of the arts connects us to the

twofold transformative potential that the activity of art making can have both on evolving the identity of an individual and on the aesthetic experiences that the art object can have on the viewer (Greene, 1995; Dewey, 1934/1980).

This study explores these issues within the context of a design studio found at a Computer Clubhouse in South Los Angeles, where youth engage in applications that encourage skills beyond typing and web browsing, allowing participants to engage more deeply in the process of designing and critiquing their own work (Kafai, Peppler, & Chapman, 2009). An example of work that can be found in this space is a piece of media art created by an 8-year-old special education student (Peppler & Warschauer, 2010). The piece features a picture of a glass of milk, a hand-drawn cookie, and clip art image of stars that rotate and change colors at dizzying speeds when the viewer clicks on the background (see Figure 3). At the same time, a recording of the artist's loose rendition of "Happy Birthday" plays. This piece is particularly interesting because the designer is unable to read or write beyond an emergent level but has tied together several different modes of communication (images, sound, and animation) to create a personally meaningful and powerfully communicative project using a visual programming language. Building on sociocultural theories of constructionism (Pinkett, 2000; Peppler & Kafai, 2007; Papert, 1980; Kafai, 2006) as well as theories of the arts and aesthetics as a democratic pedagogy (Greene, 1995; Dewey, 1934/1980), this study draws upon over three years of ethnographic research into the media arts practices of urban youth (Peppler, 2007) to focus on how youth from underprivileged communities learn about and come to understand media arts as a mix of genres, ideas, and values that they can use towards expressive and communicative ends (Peppler & Kafai, 2007). More specifically, this study explores three research objectives: (1) to document what youth learn through media art making in informal settings and whether there are any indications that media arts could be leveraged for learning in other traditional academic content areas; (2) to explore the strengths and limitations of capitalizing on youth culture, especially their preexisting knowledge of pop culture in their media art production; and (3) to investigate the distinct contributions that media arts education can make to the classroom environment. A mixed-methods approach was utilized that analyzed data from participant and professional interviews, an archive of youths' media art, and videotape documentation of youth at work on their projects. Findings point to the ways in which youth engage with technology that encourages active learning (Brown, 1988; Bonwell & Eison, 1991) and how new types of software can be used to illustrate and encourage this process. Media arts projects are

not well understood in the research literature but offer opportunities to understand how youths' media culture and media arts practices support expanded curriculum opportunities, which are more open to new technologies, respond to new media, and extend the typical classroom.

BACKGROUND

While the advantages of integrating the arts and technologies are becoming increasingly more recognized, how this can be best translated into practice and understood from the perspective of researchers in the field remains largely unseen. One indicator of the need for this type of research comes from the Arts Education Partnership, which has argued for more research in the area of technology usage in the arts classroom, noting that "[n]ew technologies—notably computers, digital sound and visual image recording, and the Internet—are changing the nature of arts education" (Arts Education Partnership, 2004). At the same time, the landscape of K-12 arts education is already changing in large schooling districts, such as Los Angeles Unified, which have recently recommended that "media arts" be included in the growth and development of arts education throughout the city (Los Angeles United School District Arts Branch Report, 2005). This creates an imperative need to better understand the role of new technologies in the arts as well as the contributions that media arts can have on learning. Thus far, a great deal of research has focused on the traditional arts (Darby & Catterall, 1994; Thomas, 2007; McCue, 2007; Greene, 1994; Eisner, 2002), yet there has been a dearth of empirical research in the emerging field of media arts. As we embark on these efforts, it is important to keep in mind the enduring issues of digital equity in our nation's schools. The current study seeks to address some of these concerns by focusing on marginalized youth without such access to new technologies or arts education in their public education.

In many ways, a media arts curriculum can be conceptualized as being fundamentally connected to the development of new literacies—the types of visual, media and other literacies that scholars would argue are central to functioning in the 21st century (Buckingham, 2003; Kress & van Leeuwen, 1996). As educators struggle to keep up with the changing demands of this new digital era, new literacy theorists argue that our very definition of literacy is expanding to include any type of communicative interaction involving speaking, reading, listening, drawing, and writing with text in print and nonprint forms (Hagood, Stevens, & Reinking, 2002). A text is now no longer a sequence of alphabetic characters on a piece of paper—rather, social arrangements, tagging, type of dress

(Moje, 2000), singing, drawing, and dancing (Gallas, 1994) can all be viewed as texts. Given this expanded view of literacy, the arts can play a crucial role in this new conceptualization and offer insights into the teaching of new literacies in a digital age. Moreover, youths' media art projects can be seen as complex forms of multimodal communication, ones that combine visual (including media images), audio, animated movement, written, and kinesthetic/interactive modes of communication. As youth engage in media arts, they acquire a set of literate practices important to the acquisition of new media literacy, technology fluency, and artistic expression that extend beyond scripted reading and writing curricula (that have focused on print forms of literacy), traditional computer courses (that have focused on basic typing skills, word processing, or web browsing), or media education (that has historically focused on the critical reading of media texts and not the authoring of those texts, Buckingham, 2003; Peppler & Kafai, 2007). In effect, through the practice of media art making, youth are becoming more fluent at communicating their ideas to others.

THEORETICAL AND PEDAGOGICAL FOUNDATIONS

Three broad concepts are important to the creation of media art: (1) active engagement in the learning process; (2) youth's personal connection to their work, which inspires a general love of learning and builds upon their prior experiences; and (3) the creation of projects that are of value to a larger community. These concepts connect to both sociocultural theories of constructionism and theories of the arts and aesthetics (Greene, 1995; Dewey, 1934/1980). Understanding media art making requires a well-articulated theory of learning and subsequent pedagogy to support it, particularly one that acknowledges the roles of the individual, the art object, and the social context in the learning process in much the same way we have argued in the past that media education involving creative production needs a clear learning and pedagogical framework (Peppler & Kafai, 2007). A pedagogy with such an orientation can be found in constructionism, which places learners in designer roles and ties together the importance of designing artifacts that are of relevance to a larger community (Papert, 1980, 1993; Kafai, 2006). This theory of learning builds upon the theory of constructivism and has been popular for several decades amongst professional media artists and scholars engaged with technologies. Yet, despite its explicit ties to the arts and design, constructionism has not heavily influenced the existing work on the arts and arts education. Constructionism places equal importance on the individual learner and on the role of social participation. Here, the

individual, the artifact, and collaborative input of the community shape learning, participation, and sharing. In the case of the Computer Clubhouse where this study was conducted, the layers of community were actually threefold, including a local community of Clubhouse members, a private intranet community of youth from 100+ Clubhouses around the world, and an online distributed community where youth kept apprised of current trends and downloadable materials for use in their projects. Additionally, sociocultural constructionists argue that the individual and the community develop reciprocally through "shared constructive activity that is resonant with both the social setting that encompasses a community of learners, as well as the cultural identity of the learners themselves" (Pinkett, 2000, p. 4). Constructionism thus serves the goals and aims of arts education because it focuses, on one level, on the design of artifacts rather than on the use of artifacts and tools, as is commonly found in other sociocultural theories of learning, and yet, on another level, it focuses on the bidirectional relationship between an individual and a community of learners.

The activity of art making is important, both from the perspectives of Dewey and from constructionist theorists, because it engages youth in the process of building, creating, and constructing artifacts—whether digital or physical. Dewey, for example, believed that art is proof that man uses materials with the intent to expand his own life as well as communicate emotional experiences with others. According to Dewey, "[a]rt denotes the process of doing or making," and provides a tool by which we search for meaning (1934/1980, p. 47). Being active in the learning process is important to current conceptions of what it means to be motivated and to engage deeply in the content. Some would argue that developing a love of learning and the desire to know more is central to the learning process. The problem then becomes how to inspire youth to make a personal commitment to these ideals and have intrinsic motivation to want to learn more (Brown, 1988; Hatano & Inagaki, 1987). This excitement for learning and deep investment in the learning process sets the stage for potential transfer to other settings and other subject areas.

As important as the activity of art making is for the individual, the artistic product can also communicate messages to others and may impact others through the experience of aesthetics. Helping us to understand better the central role of aesthetics and imagination in the artistic process, Greene's (1995) seminal work, "Releasing the Imagination," stressed that, when a young person's imagination is not released, that young person may have difficulty situating the self as well as the role of the self in a larger community. According to Dewey, the aesthetic has the capacity to stimulate the imagination, creates an "experience as

appreciative, perceiving and enjoying," and "denotes the consumer's rather than the producer's standpoint" (1980, p. 47). Dewey saw the transformative nature of the aesthetic in challenging the status quo and the dominant elite to meet the needs of democratic society. This is particularly relevant to youth in marginalized communities because they have an opportunity to write their own narratives and insert them into the dominant discourse. For disadvantaged youth, this can be an empowering and additionally motivating activity because it enables them both to develop articulated positions on issues of relevance to themselves and their communities and, through the dissemination and sharing of their work (a unique aspect of the Clubhouse learning culture in addition to being essential to learning and producing art in a digital age), to engage in a forum where they can express and develop their ideas and identities. This can set the stage for higher levels of engagement in other arenas such as school.

SITUATING MEDIA ARTS

Given its status as a new field that is still being defined, media arts should be further described for the unfamiliar reader. The field of media arts can be situated as being distinct from traditional disciplines (such as painting, drawing, or sculpting) but includes some overlap that arts educators may recognize, such as visual arts, animation, film, and, at times, electronic music.[1] This paper focuses on the overlap that media arts share with visual arts, animation, and some of the dramatic elements of film (Nalven & Jarvis, 2005; Paul, 2003; Mitchell, Inouye, & Blumenthal, 2003). In addition, media arts share much of its terminology with other fields like the sciences (e.g., gravity, mass, and acceleration), animation (e.g., tweening and motion paths), visual arts (e.g., color, perspective, and shape), and film (e.g., vocal intonation, visual style, and direction) (Paul, 2003; Mitchell, Inouye, & Blumenthal, 2003). In this sense, media arts could be described as a "metamedium." Multimodality in this context has important implications for connecting multiple types of art forms as well as the field of new literacy studies, which argues that today's youth need to become literate in combining many different modes of text that extend beyond traditional types of print literacy.

Many educators may initially feel as if they need to choose between either media arts or traditional arts as the central focus for arts education. Arguably, this is not the case. Media artist Tyler Adams adds to this discussion with the following description:

> It shouldn't be an issue of traditional versus media art—it should

> be both. There are distinct lessons to learn about drawing by hand and drawing in the computer. We encounter many concepts in media art, for example, gravity or easing, that do not translate when working with traditional materials... Media art has the aesthetic history of traditional art, but technical topics specific to the medium.

Conceptually, this tension is important to recognize when designing a K-12 arts education program, which suggests it is not necessary to think about replacing traditional arts education or even subsuming some of the goals of the arts to new media. Rather, we should think about media arts and its techniques, skills, and concepts as building on and extending traditional concepts and ideas into a new medium—one that is already highly valued by youth.

However, this perspective could at times undermine some of the inherently new aspects of the digital medium that need to be addressed in the curriculum. One example of a central characteristic of new media that extends beyond traditional concepts is the notion of interactivity as a medium for expression and communication. The term, "interactivity," is used in many fields though typically as a measure of user influence—the higher the degree of interactivity, the more influence the user has on the form and course of a media project. Interactivity is generally considered to be an attribute of new media, but older forms of artistic media such as paintings, film, and photography can certainly be seen as having some degree of interactivity in their exploration of the subject–object relationship. However, not until the introduction of new media into the arts canon did we become aware of this central characteristic and imagine ways to extend existing experiences. Interactivity in new media can also explore further ideas such as the subject's relationship to technology, allow the subject to influence the production of the object, reverse the subject–object relationship, and blur the boundaries between the relationship or at least make us aware of it. The concept of interactivity becomes a key feature as we think about learning in this new landscape—one that ties nicely to some of Dewey's ideas on activity and experience. Additionally, learning theorists have paid a great deal of attention to interactivity in the classroom context in the past but have mostly focused on instructional strategies such as the role of group problem solving, group discussion, the inclusion of brief demonstrations or short, ungraded writing exercises followed by discussion, and using feedback, debates, problem-solving models, and role playing (Brown, 1988; Bonwell & Eison, 1991). Here, we explore the role of interactivity in new media and its relationship to active learning.

In addition to such characteristics of the digital medium, media arts introduce new tools and reshape some of the fundamentals of artistic practices. Computer programming, in this context, is another tool that has entered the palette for artists. In the context of media arts, learning to write computer programs is often an important component of becoming "software literate" or having the ability to create novel user interfaces with the computer. Reas argued that "software is the medium that controls this flow of bits traversing the air and surface of our planet. Understanding software and its impact on culture is a basis for understanding and contributing to contemporary society" (2006b). Yet, this is controlled by the few who understand and use programming languages to design software. Using the societal implications of widespread literacy (in the traditional form of reading and writing), Reas argued for the potential of technological literacy on a societal scale and the reasons programming should be a central component of media arts education today (2006a, b). This overlaps with what Smith has described as "computational flexibility" (2006). Being computationally flexible builds upon literate practices involving knowing how to use computationally rich software (e.g., word processors, spreadsheets, and presentation tools) as well as how to develop fluency (i.e., knowing how and why existing tools do not meet current needs), but extends this to include the ability to create the tools that one can otherwise only imagine. This type of creativity with technology is at the core of what media artists are able to do with new media. Youth in this study are certainly creating their own software and tools in much the same way that professional media artists would go about this task—through the use of computer programming. However, it is not necessary for youth to gain an in-depth proficiency in computer programming before they can produce media art for the first time. The field has produced several shortcut tools (see, for example, Scratch or Processing) that allow youth (and adults alike) to use programming concepts, such as the use of loops, conditionals, data types, and numerical representations in a way that is more conducive to visual artists and novice programmers (Maeda, 1999; Reas, 2006b; Maloney et al., 2004). Although debates are still underway, many in the field feel that, despite the importance of programming as a central (and, some would argue, foundational) skill in media arts production, it is not the defining element of what constitutes media art: media art oftentimes requires little programming (or unimpressive code from the standpoint of a computer programmer) to make an aesthetically impactful piece.

MEDIA ARTS STUDIO: CONTEXT, TOOLS, AND ARTISTS

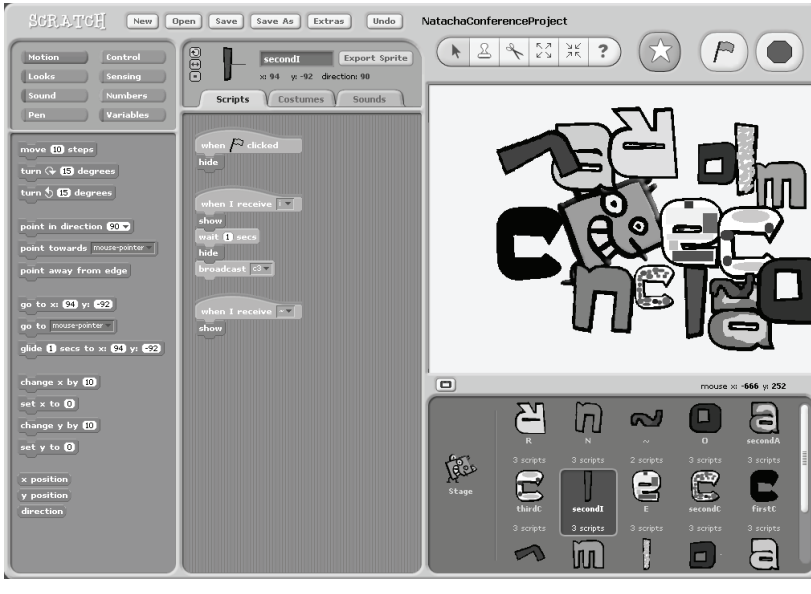
As very few formal programs exist in the schooling context that attempt to engage youth in this type of work, extracurricular practices of youth engaging in the production of media art were observed at a Computer Clubhouse in South Los Angeles, California, situated at a storefront location in one of the city's poorest areas. Young artists at this studio range in age from 8 to 18 years of age, but most are between the ages of 10 and 14 years. All of the young artists at the studio were African American or Latino. Most of the youth attended schools close by and came to the Clubhouse on a regular basis after school to work on media arts projects, surf the web, play games, do homework, or socialize. The schools in the surrounding area offer very little to no access to traditional arts and computer science classes, nor do they provide regular access to computers beyond keyboarding classes. Thus, the Clubhouse is an important site for learning in these areas. As one enters the Clubhouse, youth can be found at the clusters of desktop computers grouped along the left wall. All of the computers are networked to a central server, where youth store images, songs, or other types of files downloaded from the Internet into their personal folders. The youths' personal folders also serve as a repository of finished media arts projects and homework and, in this sense, act as a digital portfolio. At the center of the Clubhouse sits a gigantic green table, serving as the common area for youth to work away from the computers with paper, pencils, markers, or electronic parts. In the back sits a recording studio equipped with an upright piano, microphones, and recording software for youth to record, mix, and edit original music. Youth work individually and in small groups, moving fluidly between the web and the unique software applications to create integrated projects.

In this paper, we have limited our analyses to the study and discussion of artistic practices using one particular media arts software, Scratch (Maloney et al., 2004). Scratch is a media-rich programming environment, which allows young designers to use and learn essential programming skills (Maloney, Peppler, Kafai, Resnick, & Rusk, 2008). This decision was made in part because it was the most popular media arts software used by youth at the Computer Clubhouse (more than 600 projects were made in the first two years of adoption of the software) and also because Scratch enables the use of computer programming, or "creative coding" as termed here, one of the fundamentals of media art (Maeda, 2004).

For those unfamiliar with the software, Scratch differs from other novice-friendly visual programming environments (Guzdial, 2003) by using a more familiar building block command structure (Maloney et al.,

2004; Resnick, Kafai, & Maeda, 2003), which eliminates thorny debugging processes and the risk of syntax errors (see Figure 1). Bypassing the hurdle of memorizing pieces of code to program, Scratch users utilize several pages of commands that they drag to a central screen to control objects or characters. Objects can be any imported graphic image, uniquely created or drawn, or chosen from a personal archive. Designers can create or incorporate existing sound files and video, and other input/output devices can also be integrated into new design projects—truly making them media rich. Artists used this software to create video games, art objects, and animated stories among other projects. These projects can run uninterrupted in their entirety like a music video or can require the user to interact with the pieces through keystrokes (e.g., like a video game).

Figure 1. Full screenshot of the networked media arts environment, Scratch.



RESEARCH APPROACH[2]

This paper takes a mixed-methods approach to examining youth in the process of creating media art in order to address the following research questions:

1.–What do youth learn through media art making in informal

settings? Can youth learn about traditional arts concepts, skills, principles, habits of mind, and ideas during their informal explorations in media arts? What are the implications for leveraging learning in this context for learning in other academic content areas?
2. What are the strengths and limitations of capitalizing on youth culture and particularly their preexisting knowledge of pop culture in their media art production?
3. What are the distinct contributions that media arts can make to the classroom? What are youth gaining through their experiences in media arts to which they might not otherwise be exposed?

Multiple data sources were used in this study, including interviews with young media artists at the Computer Clubhouse, video footage of the youth in the process of art making, and the media arts projects stored in youths' personal folders on the Clubhouse server. The media arts projects were then discussed with four professional media artists, who were interviewed and surveyed to gather insights into the work produced by the youth and about the potential benefits of the work coming out of the Clubhouse. The data sources were analyzed in three phases, based on the three research questions.

In order to answer aspects of each of these questions, interviews at the Computer Clubhouse were conducted with 30 youth that had a range of experience with media arts production. Questions asked included the following: "What is Scratch?" "Does Scratch remind you of anything at school, at home, or off of the computer?" and "Does Scratch remind you of dance, drama, music, or visual arts?" The interviews were transcribed and coded for recurring themes (Maxwell, 2005) to allow for a better understanding of how youth situate media art making among an entire repertoire of production practices, including their prior experiences in the traditional arts.

This paper also draws upon the videotapes of over 30 case studies of youth in the process of making media art. Videotapes were transcribed and examined for recurrent themes that overlapped with the aforementioned conceptions of media arts. Events were further identified that were important to the practice of media arts production, and analyses focused on events where youth were engaged in the practice of producing media art, yet were learning about concepts important to visual arts, animation, or interactivity. A more nuanced understanding of youths' knowledge of the arts and media arts was developed by further examining their work in the collection of projects that used Scratch, referred to as the "media arts archive." The youths' work in Scratch—including animated stories, video game art, and interactive or playable art using pop

culture images and sound—were collected on a weekly basis and entered into an archive for further text-based analyses.

Finally, the paper turns to the insights of professionals in the field of media arts to conceptualize better and situate the youths' media artwork. Four media artists were interviewed in a focus group setting twice over a period of six hours. The media artists were asked to examine a random sample of 20% of the Scratch projects drawn from the media arts archive over a period of two years. Artists were asked questions like the following: "What do you see or notice about the youths' media artwork?", "What's absent from the youths' work?" and "Overall, how would you rate a particular piece of media art?"

LITERACY AND LEARNING IN NEW MEDIA

We turn to our data sources to take a closer look at youth in the act of creating media art, telling us about what youth learn while engaging in media arts production. Specifically, can youth learn about traditional concepts, skills, and habits of mind typically taught through formal instruction while engaged informally with media arts exploration?

To answer these points, we turn to a video transcript featuring a 12-year-old girl named Chandelle as she works with the author on her project, Mystic Forest (see Table 1). This excerpt helps to describe and document how youth engage in the process of media art making and to showcase various types of learning opportunities that arise in the process. In this excerpt, Chandelle encounters a problem with the perspective of a road through her forest; she was trying to create a road but instead drew an object that looked like a rectangular door. Here, she is asking for help to pinpoint what isn't right about the image. Table 1 features a transcript of the video in the first column, the gestures that were made during the video in the second column, and an interpretation of the transcript and gesture in the third column.

In this transcript, Chandelle is learning how to render two-point perspective, to draw from observation, and to draw complex shapes beyond simple rectangles and squares. This excerpt shows that, even when youth are working in a digital medium, they still confront some of the same challenges as they would during formal instruction in the traditional arts, therefore illustrating how working in media arts builds upon key traditional art concepts such as perspective, color, shape, and drawing from observation. This excerpt also suggests that youth do not necessarily need a strong "foundation" in visual arts before venturing into media arts. While there are certainly limits to ongoing self-exploration, this vignette points to the ways in which structured experiences in after-school spaces

Table 1. Video Transcript of Chandelle working in Scratch with the Author

VIDEO TRANSCRIPT	GESTURE	INTERPRETATION
1. **Chandelle:** I'm trying to, like, give it like a walkway, like a row, and then, like, trees on the side, like…a lonely forest.		Chandelle knows that something is wrong with the perspective and asks for help but is initially unable to come up with the solution.
2. **Author:** Like a lonely forest, okay. So what about the road didn't you like?		Author questions Chandelle to get her to narrow in on the problem.
3. **Chandelle:** this, like, circle right here, and it don't look like a real road.	*Chandelle points to the top part of the road.*	With questioning, Chandelle narrows in on what needs to be fixed. Chandelle's language is somewhat specific, using terms like "real" because it doesn't adhere to her sense of reality or to what she knows about perspective.
4. **Author:** What do you think it makes it look fake and not real?		Author probes Chandelle to come up with a rationale for her thinking.
5. **Chandelle**: uh...'cause it's like (exhales)...hmm...		Chandelle becomes frustrated.
6. **Author:** How do you make it look like it's going *away* from you and not standing straight up?		Author gives Chandelle a clue to think about what it might look like in real life.
7. **Chandelle:** Like that?	*Chandelle pushes back the laptop monitor past a 90-degree angle so it lays flat behind the keyboard.*	Chandelle uses the laptop to model what a road might look like for inspiration on how to draw perspective.
8. **Author:** Okay, and so what kind of shape is that? Look at that shape–		
9. **Chandelle:** A triangle?		Chandelle has difficulty identifying the shape from observation.
10. **Author:** 'kay, look at it on the screen, here. See that? Over here?	*Author has Chandelle look through the viewfinder of the video camera at the keyboard.*	
11. **Chandelle:** It look like a rectangle.		
12. **Author:** ...okay, so it's bigger right here on the screen, right?	*Author points to the screen on the camera and draws the shape with her finger.*	
13. **Chandelle:** Uh huh.		
14. **Author:** Then it goes back.		
15. **Chandelle:** Oooh!... (giggles) It kinda looks like...it's like a pyramid, kinda.	*Chandelle gestures a pyramid shape with both hands.*	Chandelle is now able to name the shape that she wants to draw and chooses to describe that shape hesitantly as a pyramid—probably because she doesn't identify it specifically as a trapezoid or quadrilateral.
16. **Author:** So what do you think of that one?		
17. **Chandelle:** Let's see. Da, this is better!	*Chandelle loads the new image with trees along the road.*	Chandelle is really satisfied with the solution.

can lead to productive engagement in arts learning.

The next excerpt features a youth named Alicia, a new 9-year-old Latina member of the Clubhouse, who builds upon the practice of stop-action animation learned from her peers. In the process of demonstrating her project to youth at neighboring stations, she takes part in further disseminating the concept to other members. The field note excerpt below describes this in more detail and provides a partial screenshot of the images that Alicia used to animate her project (see Figure 2).

Figure 2. Partial screenshot of Alicia's still-frame animation, illustrating a dragon being beheaded in Scratch.

After Alicia showed me her dragon project, I asked if she wanted to make a new project or if we could add to her project. Alicia chose to add more to her dragon project. Before we added anything, I asked Alicia how she got the dragon's head to fall off. She clicked on the dragon and showed me the seven different costumes she had to make in order to reveal the movement of the head from getting chopped off to hitting the floor. I asked how she made each costume, and she showed me by clicking on the costume and pressing edit and copying the head, then

> moving it to a new place and erasing the original. This process would have to repeat itself seven times as you copied and moved the head inch by inch to show its progression. (OC: By looking at the seven costumes, it reminded me of a cartoon flip book how it consisted of numerous pages of one drawing in different positions which in the end produced a moving character. I was surprised at how much patience Alicia had toward making that animation.) (5/16/06)

In this example, Alicia chose to engage in a very laborious and time-intensive process, revealing her attention to detail and realistic depiction. Working in Scratch developed Alicia's ability to sequence movement and separate this into individual steps. Learning to animate pushes youth to think about and abstractly model their perceptions of events, mostly with the goal of making them seem more realistic. Stop-action animation is a technique that several of the youth at the Clubhouse engaged in, using video and action figures. Work like Alicia's extended this practice into a digital medium, where she added features like user-interactivity, extending the practice beyond simply animating. Alicia demonstrated her knowledge by showing the mentor, as well as others at the Clubhouse, how her project worked, which is a common feature of the way subject-specific knowledge is passed between members in this informal space.

Shortly after Alicia shared her work with mentors and peers, five to six more projects appeared using this same animation technique. As such, this example illuminates the role of peer sharing in developing a community of media artists. Peer sharing is a central component of the expanded new view of literacy and learning and a key component of Clubhouse learning—one that is absent even in wealthier communities where youth have access to similar technologies at home. Even when youth do have access to creative technologies, they are typically underutilized in schools and are not usually shared as widely with peers if they are produced at home. Furthermore, dealing with digital materials opens the possibility of sharing artwork more widely with a distributed network of peers in the online community than would be otherwise possible with traditional types of media. Youth at the Clubhouse have access to both a local and a distributed community in which to share their work, making the learning environment very unique by today's standards.

Some additional interview excerpts are provided here to illustrate how one might use media arts to best connect to youths' experiences with other types of traditional art. In the following interview excerpts, some of connections that youth made to various art forms are explored. In the first excerpt, Breona, a 9-year-old African American female—one of the

youngest members of the Clubhouse—makes connections to other art forms and readily adopts the terminology specific to Scratch and media arts. Despite being a new member, she actively sought out experiences to engage in media art, dancing, and singing at the Clubhouse, taking on the role of a full participant fairly quickly. At the Clubhouse, she was widely recognized as being one of the top dancers across age and gender groups (Kafai & Peppler, 2008). When the interview was conducted, Breona had created two to three media art projects using Scratch and was eager to be interviewed about her work.

> Author: … Does your work in Scratch remind you of anything you do in school?
> Breona: Drawing…
> Author: … so how is Scratch like drawing?
> Breona: Because you can draw your own things, you don't have to go to costumes to pick [clip art like images]...I used to do dance, but then my mom didn't want me to do that anymore because I would always be late to stuff.
> Author: Ah...is Scratch like dancing at all?
> Breona: Yeah, you go to script and move and stuff like dancing step.

Breona made connections to writing, drawing, and dance. Interestingly, Breona acquired some of the language of Scratch, using terms like "script" and "costumes." This excerpt is a good example of how youth drew on very specific experiences in the arts as they reflected on the production process in media arts. Indeed, youth not only connect to their prior interests in new media, but also make strong connections to their informal and formal experiences with the arts as well as their schooling experiences.

Observations of these case studies indicate that youth are making connections and learning about a wide variety of subjects while engaged in their media art production. Yet, the question arises if youth are able to make such connections to academic areas explicitly when asked. To understand better the connections that youth make to their experiences in media art, interviews with the youth were conducted to determine if the youth had made any connections to their prior academic and/or artistic experiences. It is important to note that no explicit ties were made to any academic subject areas in the arts or otherwise during the course of the study, so these are connections that youth made on their own during the process of their work. When asked whether creating media art reminded the youth of anything at school, all of the youth said

it was like at least one subject matter, and most cited more than one subject they thought connected to their experiences. The most frequent response was that youth made connections to the arts (n = 20), then to language arts (n = 10), mathematics (n = 8), science (n = 5), history or social studies (n = 3), and computer class (n = 2). When probed further about the connections formed by art, youth cited a variety of answers, including drawing or sculpture (n = 11), drama (n = 6), dance (n = 3), and music (n = 4). The connections that youth made in all subject areas seemed to be dependent on youths' extent of experience in each subject area or art form. The youths' responses also seemed to echo the idea that media art acts as a "metamedium," which draws upon many different art forms and academic subject areas.

Based on these insights, it appears that youth, while making connections to subject areas across the curriculum, see their work most in line with the arts—creating a natural home for this type of work. This is a thought-provoking finding because, at face value, youth could be seen as merely learning to computer program and mix existing media—areas that might be most well suited for computer science or media education courses. Instead, youth see themselves as authors and artists, which demonstrates the creative and communicative potential that work in a digital domain can have, given the appropriate tools. Additionally, most youth did not see a connection to computer classes. This further underscores the differences between media art making and narrowly technical experiences that the youth had in computer classes, such as typing and direct instruction on word processing, digital presentation, and spreadsheet tools. Finally, second to the arts, youth connected their experiences in the media arts to their language and literacy experiences. In truth, very little reading is needed to engage in Scratch, but there is certainly quite a bit of writing and formulating ideas from base components—one of the key components of acquiring fluency in any language. Computer programmers have long since seen learning a new computer language as similar to learning a new foreign language.

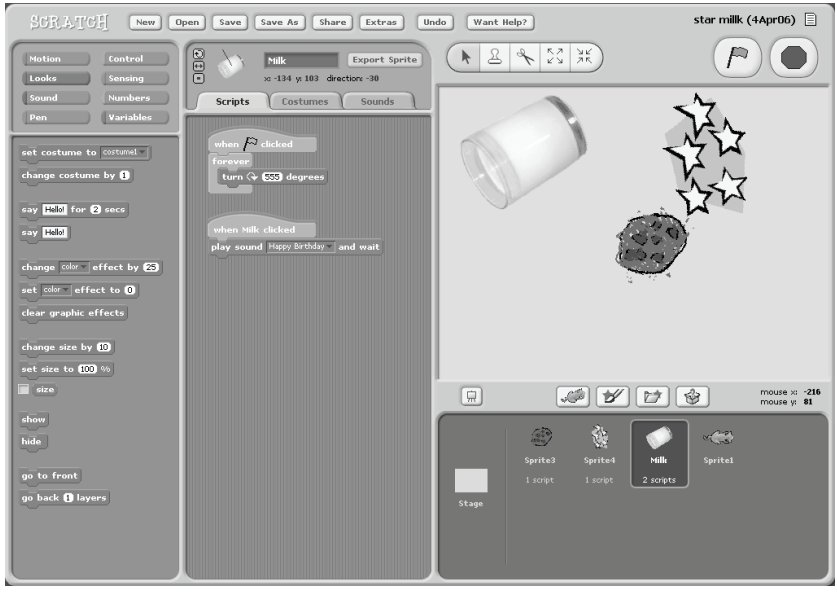
Youth seemed to be making some of these same connections—even youth that were not fluent in academic English, such as in the work example, "star milk," showcased at the start of this paper. This project was created by an 8-year-old African American youth named Brandy, who was unable to read or write beyond an emergent level and enrolled in special education classes at school, but created a unique and expressive work of media art using her Scratch project as a birthday gift for the Clubhouse coordinator. The piece ties together several modes of text, including images, animation, and her own singing, in order to create a powerfully communicative project using a visual programming language. Are these

tools accessible to all youth, even those like Brandy, who could be considered doubly or triply marginalized and at the periphery of the academic experience? Furthermore, even if they can *use* the tools, can their work contribute in meaningful ways to the media arts community? The following excerpt is from the transcription of a group discussion with professional media artists about this piece. Importantly, the media artists had no access to personal information about Brandy at the time of this discussion. Some interesting observations emerged during this conversation, including an interest in wanting to know more about the materials that were used for this project and careful analysis of the visual, audio, and overall effect of the piece.

> Media Artist, Jacob Tonski: [Star milk] is very successful as a piece of art when taken out of this context. It's still very informed by the vocabulary of Scratch….
>
> Adams: It has this strange 50s coloring theme.
>
> Media Artist, Casey Alt: This milk glass is amazing… Did she find this on the web, or import clip art?... Look, there's no cake or present. Nothing like what one would expect at a [birthday] party. That's amazing.
>
> Media Artist, Jacob Tonski: …I love her voice. It's not the right melody, but it's not wrong at all. She's like a blues singer….
>
> Adams: There are some established artists who work like this. [Ben Benjamin's] "Superbad" was at the Whitney biennial. The artist was a web designer who would create intentionally odd web designs….
>
> Alt: …I wonder if there is some compositional image element…I'm disappointed that [other youth are] importing objects, yet with her I'm fascinated. I mean, what does this mean? …For me, it comes down to originality. [Work that emulates something seen] isn't that interesting… Brandy's [work] is so off the wall, it's making something that's beautiful to her without any notion of what is supposed to be beautiful. It's very compelling.

Brandy's successes in media art production occur despite many barriers to her full participation. In formal and informal learning settings, we tend to restrict access to youth that are most prepared for such learning experiences, and, certainly with Brandy's reading and writing levels, we would assume that any activity involving computer programming would be too difficult for her. In fact, schools are returning to a back-to-basics movement that asserts entire classrooms or schools that are falling

Figure 3. Screenshot of Brandy's project, "star milk"



behind should be offered additional remedial instruction before offering such youth other enrichment opportunities. However, Brandy's success in this context has shown us that children with cognitive disabilities can succeed at media arts production despite severe deficiencies in traditional literacies.

After Brandy started actively engaging in media arts production, we witnessed a surge of interest in her traditional reading and writing activities. For the first time, Brandy started sounding out simple words, pretending to read longer passages, and opening Microsoft Word on her own and typing out nonsense paragraphs. When taking a closer look at key events in Brandy's development, we discovered that her manipulation of new media was connected to traditional literacy in several key ways (e.g., reading the command blocks, naming and saving projects, and linking blocks in logical structures) (Peppler & Warschauer, 2010). Indeed, media arts production can be a powerful entryway to development of reading and writing skills. This study thus suggests ways that youth, even with cognitive disabilities like Brandy, can move from being consumers of media to active producers of it and highlights the type of production tools and educational approaches that facilitate this transition. These findings demonstrate an expanded notion of literacy in a digital era and that

youth may see and understand the connection between writing multimodal texts and print. These findings are good indications that media arts may be a fruitful area for further exploration as an entrance into other academic content areas beyond literacy and the arts. In fact, the youth in this study were simply guided by their own interests but could see how their work could relate to other disciplines; this is probably an additionally interesting area of exploration for youth as well as researchers seeking to reconnect youth to traditional subject area content.

While these findings are important to the possibility of reconnecting youth to the schooling curriculum, the success of transferring this type of learning to other contexts is predicated on the assumption that youth enjoy the act of learning and want to engage more deeply. The Clubhouse learning model and its emphasis on self-directed learning has demonstrated its long-standing commitment to these ideals. In this context, youth are free to come and go from the Clubhouse space and also to engage in any project of their choosing. In doing so, these experiences ignite their passions (Joseph, 1999) and fuel students' more general interest in "learning how to learn." As youth were interviewed about their media artwork, a number of youth (n = 11) spontaneously cited that Scratch was "their favoritest thing ever," indicating that Scratch was well loved by many of the youth in the Clubhouse community. Learning to learn and learning to enjoy the learning process is key to future motivation and is oftentimes overlooked in today's content-driven curriculum. In engaging with the complex process of creating media art, youth experienced a love for learning and for communicating their ideas. All too often, gains in the acquisition of new knowledge (such as in math or reading scores) are equated with effective learning. What most often fails to be examined is whether the curriculum promotes an individual's wanting to engage in future learning opportunities. In the context of media art making as well as the Clubhouse setting in general, youth are inspired to engage fully for extended periods of time, setting the stage for deep learning.

GENRE, IMAGINATION, AND YOUTH CULTURE

A series of open-ended questions were asked to try to understand better how youth situated Scratch among a number of tools at home, at school, and at the Clubhouse. When asked to define Scratch, most youth responded with responses like Arnold's, an 11-year-old African American boy: "I think it's a system where you can do whatever you want. For me, I like that software because I want to make games with it." The majority of

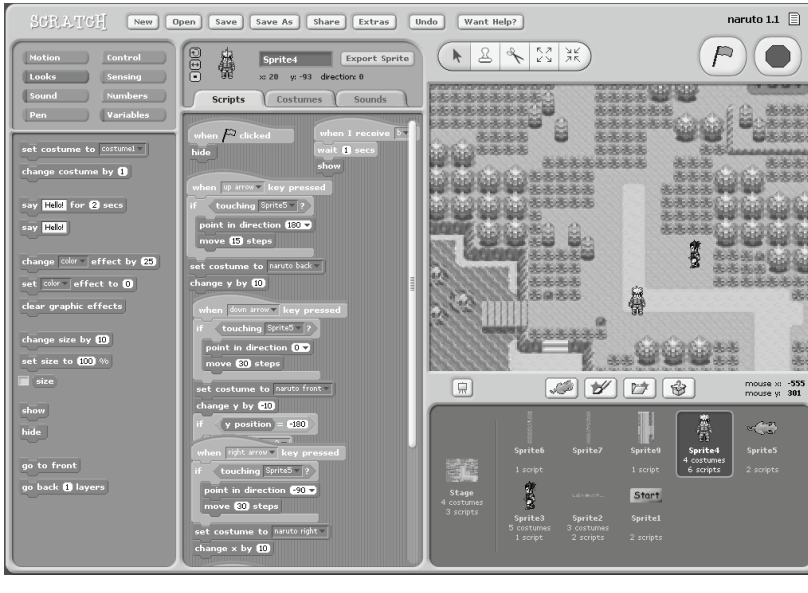
youth (n = 26) felt the same way as Arnold, indicating there were no boundaries to what could be done in Scratch and that media art making was a medium for them to produce any number of genres of work (games being just one type of project). Youth listed making animations, games, lowriders, drawings, and music videos as different types of projects, but, like Arnold, many were quick to mention that they were "specialists" in certain genres. For example, youth who made music videos made multiple music videos, and youth who specialized in game design tended to continue to make more games after their first—or to continue to build on the games they had originally made. By seeing themselves as specialists, youth are developing discreet sets of skills that then become highly valued in the Clubhouse community. Along these lines, youth mentioned that Scratch allowed them to "use your imagination to put it together," as James, an 11-year-old African American boy, stated. Statements such as this emphasized that the youth felt a certain amount of control in "putting together" what they created, which is a good indicator that they felt confident and capable in the development of their specific skills. As Maxine Greene's (1995) work would attest, young people in the process of developing their imaginations gain a better sense of self and their role in a larger community. Instead of just viewing animations or playing games, youth in this community are now able to produce their own work and share their work with others—proving that the world of pop culture producers is not so distant from their own. In this context, youth are learning to become producers and not just consumers of new media texts.

When youth were asked to reflect on whether their media arts experiences connected to their experiences outside of school and the Clubhouse, the youth said that it reminded them of "dance, cause you can pop like that [like what you can program your characters to do in Scratch]," of drawing and singing, "because I like to draw and sing here and at home," of skateboarding, "'cause when you create players [in Scratch], you create your own…people…[and] skateboards," of cartoons, and of playing video games, "because you can make them in Scratch." While this list is in no way exhaustive, it seems that just about any aspect of youth culture can permeate work in media arts. However, in the context of the arts, it is unclear what the role of popular media and, more generally, youth culture should be. In fact, this hits upon some tensions in the field that have important ramifications for youth and media arts: from the perspective of the arts, can we find merit in the high volume of youths' sampling of images, ideas, and genres from popular culture? When asked, professional media artists were unsure of where to position this type of work, in part because it embraced values that were separate from the arts community and were more in line with those of

media educators (see, for example, Buckingham, 2003). Others in the field of media education have referred to this as "remixing" (Erstad, Gilje, & de Lange, 2007), a highly valued practice that enables youth to engage in the participatory culture important to being considered literate today.

To illustrate this point, an excerpt from a discussion with professional media artists is presented here. The artists discussed a project titled, "naruto 1.1," created by a 15-year-old African American software designer named Donald (see Figure 4). The similarly titled Japanese manga, video game, and cartoons inspired this piece. The artist was aiming to become a professional game designer and felt that Scratch allowed him to explore aspects of two-dimensional game design. He worked for several weeks on this project, learning about designing games in Scratch from one of his peers at the Clubhouse. naruto 1.1 presents an interesting point of contrast when comparing this type of work with other work being done in Scratch, like star milk.

Figure 4. Screenshot of Donald's "Naruto 1.1" project, inspired by the popular Japanese manga, video game, and cartoons that are similarly titled.



Generally, media artists immediately noted that the RPG files for character and background Donald used in the aesthetic elements of his game were widely available online, making the project less artistic or original. For a different audience, however, learning to locate, download, and

remix these images is at the heart of many aspects of creative production in a media arts curriculum. Despite naruto 1.1 being an intricate example of video game emulation (considering the intuitiveness of keystrokes and the response of the environments that pan up or down when the avatar moves to the edge of the screen), the project's clear focus on emulation—and not originality—was seen as a detractor to the work's artistic merit in the eyes of professional media artists:

> Tonski: I'm assuming that he mimicked the "loading" screen… How do we talk about this project though? As art, it gets low marks… To give low marks for originality seems painful when the goal was to faithfully render something that they've seen. It's another vector.
> Alt: But that's not artistic.
> Tonski: Emulation isn't applicable to most projects.
> Alt: Emulation shouldn't be a topic used when discussing art, though.
> Adams: Warhol is like emulation, but it's original.
> Tonski: It's original *and* critical. This isn't original or critical. It's emulation.
> Adams: I can see if he was going to create a new level, but *in the style* of the video game—that would be original.
> Tonski: I think that something gets lost…though, when we… see emulation as failed originality.
> Adams: But we're looking at these from an artistic standpoint, right?
> Tonski: Then emulation shouldn't be a part of it.

During this conversation, the media artists placed a clear value on originality of concept as core to the artistic integrity of the piece, but it can probably also be considered core to any type of literacy curriculum. The group agreed that faithfully copying something is not an artistic practice (although one could also argue that many art classes may have youth emulate masterworks as a learning tool). This becomes a central issue when considering the ways that media arts and pop culture are often intertwined in the eyes of youth when working in a digital medium. If youth are unable to use emulation in their work, what impact will this have on their interest in creating media art? This is especially relevant for arts educators desiring youth in their classes to be both critical and original in their usage of popular media. To answer this question, previous work has demonstrated that referencing popular culture texts is key to interest and motivation to work in a digital medium in an informal

setting (Peppler, 2007). While the arts may not embrace this aspect of youth work in new media, it is an important consideration, as prior work has demonstrated that, when youth reference one or more pop cultural elements in their work (be it a song, a comic book character, or the hottest new animated TV show), they are significantly more likely to persevere in their project making for multiple sessions at the Clubhouse (Peppler, 2007). Moreover, artists that begin with emulation become more critical and original in their work over time (Peppler & Kafai, 2007), indicating that emulation may just be one starting point for understanding new media, which is also probably true for any medium. Clearly, there is a tie between youth culture and motivation that needs to be closely considered when creating and implementing any type of media arts curriculum.

NEW MEDIA IN THE ARTS CLASSROOM

The arts classroom could potentially be the site for more critical reflection on these various choices, effectively moving youth from creating work that simply emulates existing media to using references to put forth a message. Alt described what he felt to be excellent potential to be developed in more formal learning settings:

> I was struck by the range of work done. Some was extremely undeveloped, and others were very well developed. I was really impressed by the originality of many of the concepts but often disappointed by the choice of visual representation and execution. I think that many of the works had a lot of potential but didn't receive very much artistic encouragement to become what they could.

Building on their vast knowledge of popular culture texts, Clubhouse youth produced conceptually strong work but lacked the level of artistic development that might be expected if encouraged in the classroom context. Youths' work in new media presents promising opportunities for educators wanting to engage youth in this artistic practice.

Our first example illustrates how media arts can extend youths' participation in one subject area, such as drama. Arnold, who has been previously introduced in this paper, had been in several stage productions at school. This interview took place after Arnold had his first introduction to media arts production. This excerpt demonstrates the unique contributions that media arts can make to broaden traditional experiences in the arts:

> Arnold: [Scratch] really brings out my potential, and it actually brings out my acting experience…when you take the microphone, you can create your own voice for your character. Like, I love Arnold Schwarzenegger. Yeah, it just really brings out your potential.
> Author: …Is there anything else that reminds you of acting?
> Arnold: Thinking of what you're doing with acting, you can take it out of your mind and say, like, "in this picture we want to like do action stunts like flips and stuff." And, if you're at school, you're, like, doing "Romeo and Juliet," you can make it more funny by putting in some dragons. You can make a dragon go up to a castle and say, "I came to rescue you."

Arnold expressed excitement about his ideas for media art projects because they allowed him to do more than what he could do on stage, adding special effects and visual humor by introducing a dragon into a scene with Romeo and Juliet. Furthermore, in doing so, Arnold takes on several new roles aside from that of an actor, including special effects designer, scriptwriter, and director.

Media arts allow youth not only to explore many levels of the same art form, but also to combine many different types of artistic modalities as well as content from a wide array of subject areas. In addition, projects that capture media artists' attention capitalize on such opportunities to exploit multiple modalities. Some standout projects used simple stacks of code to, in the artist's words, "choreograph" a scene or compose an original song, demonstrating how the project simultaneously made connections between and reinforced learning in programming, dance, and music—an example of media art acting as a metamedium. The ability to make connections between multiple modalities in media arts projects is one of the unique features of the art form and distinguishes it from most traditional art forms. In addition, this is a key feature of new literacies—the ability to tie together multiple modalities of text, including, for example, images, sound, and print. In this way, media arts can extend the possibilities of the typical arts experience, allowing youth to take on roles that would otherwise be reserved for adults or experts in the community. Youth can learn something from all of these experiences, as working in a digital medium allows youth to enter at whichever level interests them most. Because media arts allow for multiple entry points into the artistic process, they allow youth to engage in drama, for example, early and fully.

Another unique feature of media arts is the ways in which projects can allow for multiple levels of interactivity, including human-to-computer

interactivity. As in the case of video games and other forms of interactive art projects, the viewer can have the unique experience of interacting with and changing the display or the activity in which they are involved. This involves a set of literacies and skills unique to this medium. Media artists observed that "the exceptional [projects] manage to stretch the technology beyond a 'stimulus–response' model of playback or interaction" and allow the viewer to engage in the piece for an indeterminate amount of time, highlighting how some youth have unknowingly started to play with interactivity as a new mode of communication currently absent from the typical arts curriculum.

When thinking about introducing media arts in the schooling curriculum, is it important that youth practices reflect those of their professional counterparts and, furthermore, whether they need to adopt the identities of professional media artists as preparation for future careers. We can learn much about this from the informal after-school environments like the Computer Clubhouse. Even though youth were making media art and programming complex projects, most youth did not recognize their projects as being a form of programming or media art. Rather, youth related to their work in the media arts through their prior experiences in the arts, their experiences at home, and at school. In general, when youth were asked, "What is computer programming to you?" they responded similarly to one youth, who said, "Computer programming? I do not have a clue." This points to a parallel to Jay Lemke's (2007) comments about kids adopting identities of scientists. He felt that researchers have a preoccupation with youth adopting professional identities, but, in reality, it was just as important that youth engage in science practices whether they know that they are doing science. Here, too, it is important that youth are engaging in the practice of art making, whether they adopt identities as media artists or computer programmers. In fact, seeing Scratch as being in line with their identities as kids, as something "cool," and as a central part of the of the art and design culture at the Clubhouse can be advantageous in this context. After all, the goal is to engage youth in media arts practices, not because they will all turn out to be designers, artists, or programmers, but because engaging youth in any art form is a "basic educational right for all students" (Darby & Catterall, 1994). This becomes even more important when over 90% of the youth that came to the Clubhouse had not attended an art class since their early experiences in elementary school.

DISCUSSION

At the heart of youths' media art production lies the ability to build a

more democratic society, one that fosters the inclusion of youth from marginalized communities, provides them with the capacity to participate in the 21st century, and actively reengages them in the learning process. With the realization that youth in their out-of-school hours are readily consuming many different forms of media art came the desire to hand over the same tools to youth to begin producing work in a wealth of modalities and, in the process, develop their collective imagination and voice. This article sought to uncover the ways in which media arts encourage designing, creating, and critiquing genres that connect to youth culture and engage youth in the process of learning more actively than what is traditionally offered in schools, particularly those in marginalized communities. The field of media arts presents many unique opportunities for educators and researchers wanting to encourage active learning, to make the schooling curriculum relevant to youths' out-of-school interests, and to teach youth how to communicate through a variety of multimodal discourses. In addition, this article aimed to showcase how media arts can encapsulate many of the aims of arts education for a digital age.

In the examples shown here, youth engaged in manipulating various types of interactivity as a medium, combined several different art forms in their work (including visual art, drama, and video game design), and capitalized on new types of interactivity afforded by the computer. In this process, youth designed interactive and aesthetic experiences for peers in their local (and distributed online) community through the production of video games and other forms of interactive art. Prior studies have shown that having an audience is an additionally motivating factor for youth to create work (Sefton-Greene & Buckingham, 1998). Furthermore, being able to imaginatively communicate to a wider audience through a medium that is a familiar language to youth changes their personal identities and their relationship to the work (Greene, 1995). In Brandy's case, for example, her intense interest in media arts production led her to see herself as an expert in the field, which in turn afforded her the previously unattained role of mentor to her peers and caused other members and adults to view her differently.

In all of these experiences, youth culture plays an integral role in setting the stage for such learning. By all accounts, today's youth are constantly immersed in a world of multimedia in after-school hours through their cell phone usage, television viewing, Internet surfing, and game playing (Rideout et al., 2005). This enables youth, on some level, to become designers instead of consumers of new technologies by capitalizing on preexisting interests in pop culture. Important to the work documented here from the Computer Clubhouse, members came equipped

with a heavy investment in reading these types of media, which acted as a natural springboard for new ideas when creating these types of texts for the first time. Even upon first exposure to the tools, such as in Arnold's case, youth immediately saw the applicability and imagined elaborate ideas of what they could construct using these types of tools. While some youth used existing models to emulate (such as in Donald's early work), others immediately started to mix these genres and ideas of their own, and still others created wholly original works (such as in Brandy's later work). The arts, with its long-standing and systematic investigation of various modes of communication, can then play an important role in shaping learning in this new area, which could potentially expand the new literacies landscape.

The flexibility of the tools for media arts production also allows for multiple entry points and the production of multiple genres of work, key to sustained engagement across youth with a wide array of backgrounds and interests. While adults might view all of these literate practices as being separate and unconnected to the goals of traditional schooling aims, youth see them as intertwined and relevant, providing a potentially strong foundation for those interested in bridging youths' out-of-school media arts practices inside the arts classroom. Finally, while youth engage in the practice of media arts production, they can still learn about concepts and skills relating to more traditional art forms as well as connect to traditional and new literacies.

MEDIA ARTS IN SCHOOLS

As marginalized youth are engage in the acts of building, creating, and constructing, they more deeply engage in the learning process. This becomes important as we think more generally about the learning that youth typically experience in disenfranchised communities. Not only did youth in this study learn to create media art for the first time, they fostered diverse connections to many other subject areas. Moreover, in some cases, this research documented how this new "learning to learn" had an impact on the youths' motivation to reengage in traditional subject areas, like print literacy. As constructionist theory would predict, the findings in this study demonstrate that, as youth leverage prior knowledge to sustain their involvement in new, complex subjects, they learn how to learn and increase their general interest in the learning process. Media arts experiences stand in stark contrast to the types of remedial instruction usually reserved for students from low-income families and those with different ethnic and racial backgrounds.

Additional implications for practice include broadening the ways that

arts, technology, and media studies could be integrated either into a new school-based curriculum or across the curriculum into other subject disciplines. Media arts involvement presents an alternate avenue for youth to learn aspects of media literacy, visual literacy, the arts, and technology—subject areas not usually found in low-income schools. In addition to the connections that media arts have to literacy and learning, there are other connections to subject areas, such as math and science, that are also worthy of further exploration. One such example includes the work of Michael Eisenberg, who has explored the arena of computational crafts and, more specifically, HyperGami (Eisenberg & Nishioka, 1996). The computational system, HyperGami, allows kids to explore solid geometry in the context of expressive construction of polyhedral models and sculptures. Similarly, programs like Scratch support many connections to mathematics that could be capitalized on in the classroom, including connections to positive and negative numbers, Cartesian coordinates, angles, greater-than and less-than relationships, and randomization. In sum, the act of creating media art has integral connections to many traditional subject areas that are worthy of further investigation as potential sites for arts integration. This also opens the door to the integration of the arts with other fields, such as the sciences, computer science, information technologies, and media education, which are also involved in most new directions of the arts. Furthermore, from prior studies, we know that the arts make these fields more attractive to women and minorities, drawing them into other underrepresented fields like computer science (Margolis & Fisher, 2002).

MEDIA ARTS FOR ARTS EDUCATORS

There are several reasons why arts educators in particular should be interested in the incorporation of the field of media arts into the schooling curriculum. Among others, current conceptions of schooling envision new technologies being integrated across the curriculum in all K-12 school subject areas to keep up with the demands of preparing youth for the 21st century. Rather, it is important to argue for an expansion of the curriculum to include teaching youth how to work with new technologies as an expressive medium and to become software literate as well as enabling youth to produce new tools and modes of communication. The arts perspective on new technologies is unique in the schooling landscape. Other fields such as technology or computer courses have the tendency to focus on narrowly technical activities. Media arts, on the other hand, offer opportunities for youth to explore the full potential of the computer as an artistic medium and consider the implications of

learning to communicate in a time when multimodal discourse is becoming increasingly important. Accordingly, this study holds implications for informing policy by emphasizing the need for arts in today's schools. In light of the increased mediation of our society, many feel there is an urgent need for arts education to develop youths' ability to be critical about the messages they receive and transmit. This study encourages and informs policy aimed at meeting technology fluency and creative thinking goals by emphasizing the critical role of producing one's own media texts in any arts education program.

Schools, then, can play an important role in this new landscape, as they are poised to address the limitations of ongoing free play in the after-school hours. Within schools, there is an opportunity to systematically introduce core media arts concepts and go into greater depth that otherwise is not possible within after-school spaces. While youth make important discoveries through unstructured learning experiences like those fostered at the Computer Clubhouse, such environments are carefully constructed and rely on the availability of high-quality interactions with adults or more expert peers, which are oftentimes scarce resources. Arts educators, by contrast, can reliably provide access to high-quality dialogs with youth engaging in digital media and potentially go into greater depth in a media arts curriculum. For educators fearing that the tools required to produce media art require too much training before any real projects can be realized, learning to computer program within the context of media arts does not necessarily involve an extensive and time-consuming introduction. It is important to note that these efforts in introducing creative coding into the context of arts education are not geared towards replacing the traditional arts or turning all youth into programmers. Rather, learning the language of creative coding is essential to communicate in a digital medium—a medium that has an increasing importance for youth and society at large.

Undoubtedly, more work needs to be done in this area. Not only is there a limited amount of research in the field of K-12 media arts education, an even smaller amount of work has been aimed at investigating how arts can be integrated into other subject areas interested in new technologies. This potential of getting youth interested in technology has not been realized in computer courses or in art classes, representing a missed opportunity for educators. Given this need to become fluent in both the arts and information technologies, it makes sense to offer interdisciplinary experiences for young children similar to those showcased here.

DIGITAL EQUITY AND THE FOUNDATIONS OF A DEMOCRATIC SOCIETY

Discussions surrounding digital equity today have expanded beyond physical access to computers and the Internet at home and schools. Today, digital equity means that all students have adequate access to information and communications technologies and actively engaging curriculum regardless of socioeconomic status, physical disability, language, race, gender, or any other characteristics that have been linked with unequal treatment. What we know about youth, particularly those in low-income and minority communities, is that, while they do have access to computers (and the youth in this study are no exception), they seldom learn more than just typing skills and how to use word processing, spreadsheet, and presentation tools. What has resulted is a "participation gap" (Jenkins, Clinton, Purushotma, Robinson, & Weigel, 2006) in access to creative technologies (especially prolonged access), which limits youths' abilities to participate fully in society around digital creativity and connectivity. This is important because, in today's society, messages are being increasingly communicated through visual, auditory, or kinesthetic means and are no longer constrained to print. In order for marginalized youth to have their voices heard in today's society, they need to have a grasp not only of print literacies but also of the entire set of new literacy and 21st century skills. Media arts increase youth's motivation to participate fully by allowing them to connect to school and become a valued member of their peer groups. Arguably, this might set the stage for higher levels of engagement in the schooling process. In this way, media arts becomes a field that can help to create the foundations of a newly democratic society, which invites marginalized youth to share their perspectives and viewpoints with others. With the growing threat of exclusion and disenfranchisement, the Computer Clubhouse offers one example of how to provide youth with access to design software in a meaningful way.

Acknowledgments

The analyses and writing of this paper were supported by a Spencer Foundation Dissertation Year Fellowship to the author and in part by grants from the UCLA Center for Community Partnerships and the National Science Foundation (NSF-0325828: Resnick, Kafai & Maeda) to Yasmin B. Kafai at UCLA, conducted in collaboration with Mitchel Resnick's research group at the MIT Media Lab. I would also like to take this opportunity to thank Yasmin B. Kafai, James S. Catterall, Casey Reas, Ernest Morrell, and Joyce Alexander for challenging the theoretical claims and helping to clarify many

aspects of this work. I would like to thank Natashka Jones and the youth at the Computer Clubhouse for providing the inspiration for this research and for continuing to challenge and inspire my thinking. The views expressed are those of the author and do not necessarily represent the views of the supporting funding agencies or Indiana University, Bloomington.

Notes

1. To understand better how professionals in the field of media arts understand and situate their practices, four professional media artists were invited to share their insights, all of whom were enrolled in an MFA program and had extensive prior professional experiences in the field as artists, designers, technologists, computer scientists, and/or media theorists. Their thoughts and comments are woven throughout this section of the paper that situates media arts as a field. Later on in the paper, they are quoted more directly as they shared their insights produced by the youth at the Clubhouse.
2. This study draws on data that was collected as part of a larger research project funded by the National Science Foundation (NSF-0325828), involving the development and implementation of a media-rich programming environment in the Computer Clubhouse network (Resnick, Kafai, & Maeda, 2003; Kafai, Peppler, & Chiu, 2007).

References

Arts Education Partnership. (2004). *The arts and education: New opportunities for research.* Washington, DC: Arts Education Partnership.

Bonwell, C., & Eison, J. (1991). *Active learning: Creating excitement in the classroom.* ASHE-ERIC Higher Education Report No. 1. Washington, DC: The George Washington University, School of Education and Development.

Brown, A. (1988). Motivation to learn and understand: On taking charge of one's own learning. *Cognition and Instruction, 5*(4), 311–321.

Buckingham, D. (2003). *Media education: Literacy, learning and contemporary culture.* Cambridge, England: Polity Press.

Darby, J. T., & Catterall, J. S. (1994). The fourth R: The arts and learning. *Teachers College Record, 96*(2), 299–328.

Dewey, J. (1934/1980). *Art as Experience.* New York, NY: The Berkley Publishing Group.

Eisner, E. W. (2002). *The arts and the creation of mind.* New Haven, CT: Yale University Press.

Eisenberg, M., & Nishioka, A. (1994). HyperGami: A computational system for creating decorated paper constructions. *Proceedings of Second International Meeting of Origami Science and Scientific Origami,* Otsu, Shiga, Japan.

Erstad, O., Gilje, Ø., & de Lange, T. (2007). Re-mixing multimodal resources: multiliteracies and digital production in Norwegian media education. *Learning, Media and Technology, 32*(2), 183–198.

Gallas, K. (1994). *Languages of learning: How children talk, write, dance, draw, and sing their understanding of the world.* New York, NY: Teachers College Press.

Greene, M. (1994). Carpe diem: The arts and school restructuring. *Teachers College Record, 9*(4), 494–507.

Greene, M. (1995). *Releasing the imagination.* New York, NY: Jossey-Bass.

Guzdial, M. (2003). *Programming environments for novices* (Unpublished manuscript). Atlanta, GA.

Hagood, M. C., Stevens, L. P., & Reinking, D. (2002). What do THEY have to teach US? Talkin' 'cross generations! In D. E. Alvermann (Ed.), *Adolescents and literacies in a digital world* (pp. 68–83). New York, NY: Peter Lang Publishing.

Hatano, G., & Inagaki, K. (1987). A theory of motivation for comprehension and its application to mathematics instruction. In T. A. Romberg & D. M. Steward (Eds.), *The monitoring of school mathematics: Background papers. Vol. 2. Implications from psychology, outcomes of instruction* (Program Report 87-2, pp. 27–66). Madison WI: Wisconsin Center for Educational Research.

Hirshberg, J., Bereiter, C., & Hughes, A. (1989). *Open court*. LaSalle, IL: Open Court.

Jenkins, H., Clinton, K., Purushotma, R., Robinson, A. J., & Weigel, M. (2006). *Confronting the challenges of participatory culture: Media education for the 21st century*. Chicago, IL: MacArthur Foundation.

Joseph, D. (1999). *The passion curriculum design approach: Organizing learning environments around learner interest*. Presentation to the Motivation in Education Special Interest Group at the Annual Meeting of the American Educational Research Association, Montreal, Quebec, Canada.

Kafai, Y. B. (2006). Constructionism. In K. Sawyer (Ed.), *Cambridge handbook of the learning sciences*. Cambridge, MA: Cambridge University Press.

Kafai, Y., Peppler, K., & Chiu, G. (2007). High tech programmers in low-income communities: Seeding reform in a community technology center. In C. Steinfeld, B. T. Pentland, M. Ackerman, & N. Contractor (Eds.), *Communities and technologies: Proceedings of the Third Communities and Technologies Conference* (pp. 545–564). London, England: Springer.

Kafai, Y., & Peppler, K. (2008). Learning from krumping: Collective agency in dance performance cultures. *Proceedings of the 2008 International Conference of the Learning Sciences (ICLS), Utrecht, Netherlands, 1*, 430–437.

Kafai, Y.B., Peppler, K., & Chapman, R. (Eds.) (2009). *The Computer Clubhouse: Creativity and constructionism in youth communities*. New York, NY: Teachers College Press.

Kress, G., & van Leeuwen, T. (1996). *Reading images: The grammar of visual design*. London, England: Routledge.

Los Angeles Unified School District Arts Branch (2005). *Media arts study group report*. Los Angeles, CA: Los Angeles Unified School District Arts Branch. Retrieved from http://artseducation.lausd.net/portal.php?id=MEDI

Lemke (2007, April). *Where in the world is the science in Whyville? Informal science in a multi-user virtual community*. Invited discussant at the 2007 American Education Research Association (AERA) in Chicago, IL.

Maeda, J. (1999). *Design by numbers*. Cambridge, MA: The MIT Press.

Maeda, J. (2004). *Creative code*. New York, NY: Thames & Hudson Inc.

Maloney, J., Burd, L., Kafai, Y., Rusk, N., Silverman, B., & Resnick, M. (2004, January). *Scratch: A sneak preview*. Paper presented at the Second International Conference on Creating, Connecting, and Collaborating through Computing, Kyoto, Japan.

Maloney, J., Peppler, K., Kafai, Y., Resnick, M., & Rusk, N. (2008). *Programming by choice: Urban youth learning programming with Scratch*. Proceedings published by the ACM Special Interest Group on Computer Science Education, Portland, OR.

Margolis, J., & Fisher, A. (2002). *Unlocking the clubhouse: Women in computing*. Cambridge, MA: The MIT Press.

Maxwell, J. A. (2005). *Qualitative research design: An interactive approach* (Vol. 41). Thousand Oaks, CA: SAGE.

McCue, F. (2007). The arts and civic space: An experiment in community education. *Teachers College Record, 109*(3), pp. 590–602.

Mitchell, W. J., Inouye, A. S., & Blumenthal, M. S. (2003). *Beyond productivity: Information technology, innovation, and creativity*. Washington, DC: The National Academies Press.

Moje, E. B. (2000). "To be part of the story": The literacy practices of gangsta adolescents. *Teachers College Record, 102*(3), 651–690.

Muchnic, S. (2005, April 24). Art on the move. *Los Angeles Times,* pp. E1, E34–36.
Nalven, J., & Jarvis, J. (2005) Going digital: The practice and vision of digital artists. Boston, MA: Thomson Course Technology.
No Child Left Behind Act of 2001, Pub. L. No. 107-110, 115 Stat. 1425 (2002).
Oakes, J. (2005). *Keeping track: How schools structure inequality* (2nd ed.). New Haven, CT: Yale University Press.
Paul, C. (2003). *Digital art.* New York, NY: Thames & Hudson.
Papert, S. (1980). *Mindstorms: Children, computers, and powerful ideas.* New York, NY: Basic Books.
Papert, S. (1993). *The children's machine.* New York, NY: Basic Books.
Peppler, K. (2007). *Creative bytes: Literacy and learning in the media arts practices of urban youth* (Unpublished doctoral dissertation). UCLA: Los Angeles, CA.
Peppler, K., & Kafai, Y. B. (2007). From *SuperGoo* to *Scratch*: Exploring creative production in an informal learning environment. *Learning, Media, and Technology, 32*(2), 149–166.
Peppler, K., & Warschauer, M. (2010). Lessons from Brandy: Creative media production by a child with cognitive (dis)abilities. Paper presentation at the American Educational Research Association (AERA), Denver, CO.
Pinkett, R. D. (2000). *Bridging the digital divide: Sociocultural constructionism and an asset-based approach to community technology and community building.* Paper presented at the Eighty-first Annual Meeting of the American Educational Research Association, New Orleans, LA.
Poissant, L. (2005). *New media dictionary.* Retrieved from http://mitpress.mit.edu/e-journals/LEA/NMD/nmdhome.html
Reas, C. (2006a). Media literacy: Twenty-first century arts education. *AI & Society, 20*(4), 444–445.
Reas, C. (2006b). Processing: programming for the media arts. *AI & Society, 20*(4), 526–538.
Resnick, M., Kafai, Y., & Maeda, J. (2003). *ITR: A networked, media-rich programming environment to enhance technological fluency at after-school centers in economically disadvantaged communities.* Proposal submitted to National Science Foundation.
Rideout, V., Roberts, D. F., & Foehr, U. G. (2005). *Generation M: Media in the lives of 8–18 year-olds.* Menlo Park, CA: Kaiser Family Foundation.
Sefton-Green, J., & Buckingham, D. (1998). Digital visions: Children's "creative" uses of multimedia technologies. In J. Sefton-Green (Ed.), *Digital Diversions: Youth culture in the age of multimedia* (pp. 62–83). London, England: UCL Press.
Smith, B. K. (2006). Design and computational flexibility. *Digital Creativity, 17*(2), 65–72.
Thomas, E. (2007). Student engagement and learning in a community-based arts classroom. *Teachers College Record, 109*(3), 770–796.

KYLIE A. PEPPLER is Assistant Professor in the Learning Sciences Program at Indiana University, Bloomington. As a visual and new media artist by training, Peppler engages in research that focuses on the intersection of arts, new technologies, and informal learning. A Dissertation-Year Fellowship from the Spencer Foundation as well as a UC Presidential Postdoctoral Fellowship supported her early work in these areas. Peppler's recent work has appeared in the *Cambridge Journal of Education, Learning, Media and Technology*, *E-Learning*, and the *International Journal of Learning and Media*. She also has a new co-edited book titled, *The Computer*

Clubhouse: Constructionism and Creativity in Youth Communities (Teachers College Press, 2009). Currently, Peppler is a co-PI on two studies funded by the National Science Foundation (CIS# 0855868/0855773/0855886 and CIS# 0855852) on creativity in youth online communities as well as a PI on a grant from the Catherine T. and John D. MacArthur Foundation to develop a curriculum to foster systems thinking using new design technologies in schools and after-school settings.