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What is This?
COMPUGIRLS’ Standpoint: Culturally Responsive Computing and Its Effect on Girls of Color

Kimberly A. Scott1 and Mary Aleta White2

Abstract
This article investigates the motivations of African American and Latino girls (N = 41) who navigate urban Southwest school districts during the day, but voluntarily attend a 2-year, culturally responsive multimedia program after school and into the summer. Understanding that girls from economically disadvantaged settings are indeed motivated to become technological innovators but often do not have access to the necessary resources to follow their interest, our program—entitled COMPUGIRLS—assumes a culturally responsive computing approach. This research examines particular features of the program (e.g., asset building, reflections, and connectedness) that attracted and retained the Latina (74%) and African American (19%) adolescent (ages 13-18) participants as well as to what extent the culturally relevant aspects of the curriculum assist with program retention and/or affect the students’ vision of themselves as a future technologist. An evaluative approach gathered 2 years of data from the participants. Field notes from observations and interviews were transcribed and reviewed to extract themes and areas of convergence. As a standpoint theory project, the authors center the girls’ voices as the primary data sources. Two primary themes emerged from the data to explain girls’ sustained motivation. The

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first was the challenge of learning and mastering the technology. For many, this also included disproving the stereotypes of their abilities by age, gender, and race. The second theme was being able to manipulate technology and learning experiences as a means of self-expression and research, particularly if the results could be used to inform their community and peers. The authors posit that much of the program impact was because of the culturally responsive practices (asset building, reflection, and connectedness) embedded within the curriculum. Implications for urban educators and program developers are considered.

**Keywords**

motivation, culturally responsive practices, standpoint theory, girls

**Introduction**

African American and Latino students are 3 times more likely to attend urban, underresourced schools than their White counterparts (Orfield & Lee, 2005). As a result, these populations have limited access to technologically savvy teachers and advanced computer science courses (Goode, 2007; Margolis, Estrella, Goode, Holme, Nao, 2008). For girls, these contextual variables are often compounded by chilly, culturally irrelevant environments (Scott, Aist, & Hood, 2009), gender stereotypes, and males and females’ different responses to incentives in STEM education and STEM employment (Gayles & Ampaw, 2011; National Science Foundation, 2011; Viadero, 2009). These reasons explain, in part, why in 2009, only 8% of computing occupations were held by women of color (U.S. Department of Labor, 2009). Another explanation for this lack of participation is the myth that girls of color are simply not interested in or motivated to pursue STEM careers in general and digital media in particular. In our experiences attending national and international meetings about digital equity, we hear all too often scholars and practitioners claiming that “these girls” (code for girls from urban settings) do not “care” about digital media like their more affluent and/or White counterparts.

This article assumes an oppositional argument. We contend that despite structural impediments, many girls of color are interested in technology fields but lack culturally relevant opportunities to pursue such disciplines. To understand how a unique context that does include culturally relevant computing practices affects girls’ motivation pre- and post-programmatic engagement, we rely on standpoint theory (Collins, 1986, 2000, 2002; Smith, 1987)—a heuristic often used in feminist studies as a methodological tool.
Consequently, this project seeks to broaden space for marginalized voices to be heard (Ladson-Billings, 2000), humanize experiences beyond stereotypic images (Ladson-Billings, 2003), empower both researchers and participants (Dillard, 2000; Ladson-Billings, 2000, 2004; Milner, 2006), and develop a culturally relevant, multimedia program funded by the National Science Foundation (NSF #0833773), COMPUGIRLS.

On the surface, COMPUGIRLS uses digital media to enact a clear social justice agenda. That few girls of color are entering the most lucrative and stable of 21st-century fields—that is, information communication technology (ICT)—should be reason for alarm. In essence, their conspicuous and consistent absence further illustrates how technological workforce development continues to follow historical patterns reinforcing race, gender, and social class divides. For many, however, the social justice argument is insufficient. Thus, we consider the following—the loss of technological potential also inhibits our society’s ability to be truly innovative. Without a more diverse workforce that includes underrepresented groups, such as women of color from urban areas, our society’s ability to create will remain limited to the imaginations of a select few (Sandvig, 2008). And these few do not often represent the interests of the growing K-12 populations (see, for example, Irizarry & Donaldson, 2012). One need only examine the tension between game design images and their reinscription of race–gender stereotypes (see Clark, Sheridan, & Williams, in this volume, for more) to understand the significance of this point. Beyond games, the lack of more diverse technological innovators leads to other pernicious results at both macro- and micro-levels.

Despite multiple efforts to provide counternormative images of computer science, most adolescents describe computer scientists as White males mesmerized by a blank screen, working in dark isolation from others. This image is not too surprising given recent statistics (see National Academy of Sciences, 2007; National Science Foundation, 2011). The vast majority of computer scientists are White men. Reasons for this disparity tend to prioritize one sociocultural feature (e.g., race or social class) over another rather than explore the points of convergence that produce intragroup differences. Intersecting race with gender and social class promotes different questions of self-image and technological potential. How do African American and/or Latina girls from economically disadvantaged settings perceive their technological potential? How can an enrichment program nurture participating girls’ self-image as future technologists? Both inquiries remain rooted in non–cultural-deficit beliefs and consider more than individual differences. Unfortunately, cultural deficit thinking continues to prevail whereas students
from urban areas and their communities are often perceived as technophobic and/or lacking basic technological motivation (see Monroe, 2004).

In the following sections, we problematize the image of presumed technological deficiency by considering how stereotypic images of technological dexterity may influence present and future self-perceptions, the potency of standpoint theory to understand efforts that challenge the taken-for-granted images, and the actualization of wedding culturally responsive practices to culturally responsive computing as a theoretical frame for our multimedia enrichment program, COMPUGIRLS. Our efforts remain predicated on a counternormative assumption; that is, girls from urban districts are motivated to become technologists if provided culturally responsive multimedia activities. We present qualitative data testing this supposition and conclude this piece discussing the implications of our efforts.

**Theoretical Frames**

Many discussions explaining the underrepresentation of students of color entering STEM often focus on the effects of low-level academic qualifications and/or interest and inclination toward such fields (Smyth & McArdle, 2004). However, Cheryan and Plaut (2010), among others, note the importance of social predictors such as perceived similarity to the people in the field, social identity threats, and expectations of success. Individuals aware of negative characterizations of their group as it affects the group’s intelligence worry that poor performance may confirm the stereotypes of their group (Cohen, Manion, & Morrison, 2007, p. 313) and could lead to poor performance. This psychological threat can have a negative recursive effects in school environments—psychological threat/poor performance feed off each other causing a continuous cycle of underachievement (p. 1309). It is of little surprise when the President’s Council of Advisors on Science and Technology (PCAST, 2010) reports that as early as elementary school, many students from high needs contexts believe they cannot excel in STEM and/or maintain that these disciplines are for certain students—youngsters who do not necessarily share the same race/ethnic or socioeconomic backgrounds. If conscious efforts were made to challenge this image with strategies that consider this and other information about cultural identity, what would be the effect on self-perception as developing technologists?

Students’ perception of their current cultural identities greatly influences the value they have for activities (both academic and nonacademic). For African American and Latina girls navigating economically challenged schools, such as those located in urban settings, the meaning the larger society constructs of their abilities and capacities will affect the girls’ engagement in multiple areas. Granted, the effect is not exclusively tethered to the
larger society’s understanding or positioning of girls’ race, gender, and social-class identities. The girls’ own self-perceptions can depress biased ideas. Stated more simply, if I cannot see my self—defined by multiple elements of my cultural identity—as being a technologist, my motivation to develop an image of this identity and engage in and value activities related to becoming a technologist may decrease over time. It is therefore important not only to track students’ understanding of themselves along various divides (e.g., race, gender, social class) but also their developing identities while completing specific activities. For our purposes, accessing participating girls’ voices while engaging in culturally responsive computing activities proves to be critical for exploring their motivations as potential technologists.

A great deal of research and programs have emerged attempting to describe girls’ perceptions of career pathways and/or direct them more linearly toward choosing technology as a viable career. As girls enter their adolescent years (e.g., Grade 8) they begin to explore multiple aspects of future life (Nurmi, Poole, & Kalakowski, 1998; Salmelo-Aro & Nurmi, 1997). While instructive, the results of such efforts rarely account for and examine how the complexities of identity intersect and shape the process of an individual’s developing consciousness (Gilborn & Youdell, 2009) and ultimately their perspectives in future careers.

The limited works that apply an intersectional approach suggest interesting data that challenge above notions of disinterest. For instance, some girls of color often hold greater motivation to major in a computer field than their White counterparts (Benyo & White, 2009), yet this trend does not translate to actual enrollment (Ong, Wright, Espinosa, & Orfield, 2011). For African American women and men, self-efficacy does not seem to be as significant a determinant for technology career choice as it is for other groups (Johnson, Phillips, & Stone, 2008; Lent et al., 2005). This suggests that although enrichment programs may invigorate self-efficacy about STEM careers (Scantlebury & Baker, 2007) and build students’ skills these efforts are not sufficient to encouraging more girls from urban areas to enter technology. How do girls in our program make sense of their identities and experiences in their own words?

For our purposes, we utilize standpoint theory as a methodology. We acknowledge that the multipart voices constituting girls’ of color lives has not been accessed or valued in any large degree (Collins, 2000; Crenshaw, 1991). Stories that attend to raced-, gendered-female groups tend to be dismissed and/or devalued. This process, described by Delgado and Villalpando (2002) as an “apartheid of knowledge,” muddies our identities, preventing complete understanding of how social categories may work to operationalize certain identities and truths (Scott, 2012). Equally important, standpoint theory recognizes that we construct our knowledge by interacting with each
other from our respective and situated social positions. While our locations are fluid and depend on the meaning a given contexts gives to race, social class, gender, ethnicity, and other sociocultural features, standpoint theorists understand that “when individuals share a particular social status or social location, they often share meaningful experiences, which can generate shared knowledge about the social world” (Harnois, 2010, p. 68). Status or location is best understood through the perspectives of the target audience as the weight of the variables may differ. The employment of standpoint theory directed our steps to relentlessly focus on participating girls’ perceptions of our program and their selves in the culturally responsive setting.

Educational research illustrates the positive effects of culturally responsive practices on children’s of color self-concept and achievement (Hilliard, 2003; Lee, 2007; Villegas & Lucas, 2004). Culturally responsive teachers create an educative environment that validates and is comprehensive, multidimensional, empowering, transformative, and emancipatory (Gay, 2000). Central to this process is understanding that students’ identities are “neither monolithic nor static but rather a dynamic aspect of their overall identity” (Scott et al., 2009, p. 36). COMPUGIRLS includes these tenets by training carefully select graduate students and in-service teachers to enact certain practices we believe serve as indicators of culturally responsive computing.

Similar to Paris’ (2012) suggestion that culturally relevant practice should be sustainable, our primary objective is to create an environment in which participants become technologically empowered innovators who use multimedia for community advancements. Given the ubiquity of digital media and its impact on our lives, we envision multimedia as the contemporary ways young people can use to sustain culturally relevant practices (p. 95). We draw on culturally responsive indicators to construct three pillars on which COMPUGIRLS’ culturally responsive computing practices stand—asset building, reflective, and connectedness. Following a general description of the program, we articulate how we applied these three tenets within our project.

Method

COMPUGIRLS: Site and Participants

Over the course of 2 years, adolescent girls (ages 13-18) from three Southwest high-needs districts attend summer and after-school courses. Two of the three districts house only high schools with the third serving as an elementary feeder school district (Grades pk-8) to one of the two. In the contextualized aggregate, these districts represent the typical characteristics of an urban school. Except for one of the high school districts, the other two host students
who for the large part qualify for free or reduced lunch (82-90%), disproportionately serve race/ethnic minority students (African America 10%, Latino 62%, White 19%, and Native American 3%), and have less than 50% of high school students passing statewide assessment. The districts are all within a metropolitan area that contains nearly 1.5 million residents.

Our foci encourage COMPUGIRLS to use multimedia activities as a means of encouraging computational thinking, enhance girls’ technosocial analytical skills using culturally relevant practices, and provide girls with a dynamic, fun learning environment that nurtures the development of a positive self-concept. Although our program hosted its first set of sessions during the summer 2007, the present data focus on the summer 2009 cohort of 41 girls. With the vast majority of girls being Latina (74%) followed by a sizable African American population (19% compared to the state average of 3%), the majority of participants were in high school (61%) with the mean age of 14.5 years.

Research participants travel to a nearby university campus. Participating girls need not possess any technological skills, maintain a high grade point average, or even be enrolled in high school. Rather, COMPUGIRLS represent diverse educational and social backgrounds ranging from teen mothers, high school–push-outs, and/or technologically adept, to girls who have never interacted with a computer. The bounding feature among the participants is they all write a compelling essay that a subcommittee of the program’s advisory board scores highly. Specifically, a number \( n = 3 \) of COMPUGIRLS’ advisory board members assess each applicant’s essays in which prospective girls write why they want to participate in the program and what they hope to get out of the experience. Committee reviewers’ are more concerned with substance than any other variable. Scoring follows a point system: Grammar (3 points) + Content (7 points) = 10 points possible. Following the screening process, we contact the top 58 applicants based on their total scores. Finally, 41 applicants travelled to COMPUGIRLS’ university-site in the summer of 2009. This article concentrates on the experiences of this particular cohort.

Once admitted, girls work in groups for Course 1 and identify a social/community issue to research. The various programs (i.e., iLife, SIMS, SCRATCH, and Teen Second life) and loaned hardware (e.g., cameras, camcorders, laptops, microphones) become manipulative tools for the girls to display both their results and present their scholastic journey. With topics ranging from the negative effects of gentrification on urban areas, consequences of early motherhood, and alcoholism in Indigenous Communities, participating girls work in small groups facilitated by trained mentor-teachers. All COMPUGIRLS’ courses (see Figure 1) require girls to create a digital product using various programs and a research paper including a
clearly articulated research question, peer-reviewed references, primary data (e.g., interview, focus groups, surveys), analysis and implications of their findings. With complete access to the university’s databases containing peer-reviewed journals, girls attend summer sessions at approximately 20 hours a week over 4 days for 5 weeks, fall and spring sessions 1 day after school, and a Saturday morning for close to 10 weeks each season over the 2-year period. We scheduled approximately 500 hours of in-session instructional time. However, COMPUGIRLS and their mentor-teachers regularly met for many more hours beyond this calendar of events, believing the supplemental hours are needed to complete their projects.

Carefully selected graduate students from various disciplines and in-service teachers from participating districts engage in approximately 80 hours of training throughout the 2-year period. Pivotal to their efforts is their ability to create and implement culturally responsive computing practices that indicate asset building, reflection, and connectedness.

Asset building: Through classroom-based discussions and lectures, the principal investigators encourage mentor-teachers to recognize and integrate participants’ technological and subject area knowledge as valuable to the COMPUGIRLS learning process. This requires a great deal of space within the curriculum, whereas mentor-teachers need to build sufficient rapport with the COMPUGIRL students so that the youngsters believe their voices are being heard. To this end, mentor-teachers work closely with preassigned groups (n = 5) of girls to ensure the cohorts accomplish both daily and session-long goals. Although all groups occupy one large space to allow for

<table>
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<tr>
<th>Course I</th>
<th>Course II</th>
<th>Course III</th>
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<tbody>
<tr>
<td>Introduction: Introduction to social justice, media, and technology</td>
<td>The Sims: Participants design a virtual world in which they determine the trajectory of their characters’ lives</td>
<td>Scratch: Participants learn and manipulate graphical programming language to create animation, games, music and art.</td>
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<th>Course IV</th>
<th>Course V</th>
<th>Course VI</th>
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<tr>
<td>Intro to Teen Second Life: Participants create characters and begin to operate in a virtual world</td>
<td>Teen Second Life: Participants begin social justice projects to affect change in virtual world.</td>
<td>Capstone of Teen Second Life: Participants execute proposed projects in virtual world.</td>
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Figure 1. Course sequence.
the limited whole-group lessons, the vast majority of classroom time COMPUGIRLS spend with their small groups facilitated by mentor-teachers. While specific objectives are articulated weeks in advance, we encourage mentor-teachers to build in a considerable amount of time in the beginning of the sessions to dialogue with their cohorts about what they know.

Reflection: While it is valuable that the COMPUGIRLS articulate what they know and mentor-teachers build upon it without depressing the program’s technological and research expectations, it is equally important for the girls to consider how they have come to know the knowledge. Therefore, mentor-teachers nurture an environment that encourages participants to respectfully challenge each other to think more deeply about their topics, their behaviors, and their identities along various divides.

Connectedness: Research indicates that particularly for African American girls, feeling a sense of accountability to something larger than one’s self encourages achievement (Connell, Halpern-Felsher, Crichlow, & Usinger, 1995; Osterman, 2000). Within COMPUGIRLS, we encourage participants to create a peer culture in which they feel connected to each other and their communities. To this end, we encourage them to use their burgeoning research and technological knowledge to strengthen their ties with each other and their community in culturally responsive ways.

Based on our curricular attempts and belief that despite lack of opportunity COMPUGIRLS students are motivated to engage in technologically rigorous activities that are culturally responsive, we explore two essential questions:

1. What features motivated participants to enroll and to remain in the program?
2. How did the culturally relevant experience affect their perception of self as future technologists and maturing women of color?

Data Collection

In conjunction with the targeted program staff, the project evaluator conducted a comprehensive assessment using student journals, focus groups, interviews, document review, and observations. The project collected quantitative measures using a variety of survey instruments, and those results are reported elsewhere. This article utilizes two years’ worth (2009-2011) of qualitative data. Focus groups met depending upon the leader’s intent. For instance, Scott led the focus groups approximately half way through each of the six courses to encourage girls to articulate programmatic dilemmas or laud specific elements. These discussions required all mentor-teachers and
staff to vacate the room while Scott organized what the girls called Wrap Sessions—we aimed to wrap up any loose ends before the sessions concluded. Scott assured the girls that no names would be used to maintain confidentiality but that the girls’ comments would be taken seriously. Each session began with Scott posing a simple question. “What is going well?” This interrogative was quickly followed with “What needs to change?” In an open forum, Scott would take notes marking the girls’ complaints and reasons for applause. Often dialogue would include girls offering their own set of resolutions. Immediately following these conversations, Scott would transcribe her notes. White’s focus groups assumed a different approach.

White’s student focus groups were conducted during their regular program attendance. During the initial year (summer 2009 to spring 2010), students participated in eight focus group sessions during the summer, one during the fall, and two during the spring semester. During the second year (summer 2010 to spring, 2011), selected students participated in two groups each semester. The questions asked required girls to consider their reasons for joining COMPUGIRLS, to describe their expectations, to articulate their motivations for continuing, and to develop their consciousness of the link between social justice and technology. Students were selected for focus groups using a rotational method so that each had a chance to participate at least once during an academic year. The groups met for 30 to 40 minutes at a time. The collection of focus group data (audiotaped and later transcribed) were summarized by questions. The major codes studied included motivation, learning, and program impact.

Both Scott and White conducted regular 1-hour weekly observations of the COMPUGIRLS throughout the life of the program. For Scott, she often served as a participant-observer, interacting with the girls and seizing several moments to conduct informal interviews as they explained their progress. Often COMPUGIRLS requested to speak with Scott about their individual or group accomplishments. During such impromptu presentations, Scott provided feedback to the girls, regularly asking them to reflect about their intent, how well they believed it attended to social justice ideals, and to consider the micro- and macro-level implications of their digital presentations and content. Since Scott spent more time dialoguing with the girls, she typically waited to transcribe her observation notes until after leaving the classroom or limited her observational time to when there was whole-group instruction. Like Scott, White took notes on the girls’ tasks and activities, peer group dialogues and interactions, level of interactivity, their relationship with mentor-teachers and peers expressed by both verbal and nonverbal cues, and evidence of comprehension.
Data Analysis

This research is a standpoint project as it seeks to redefine “epistemic standards for more accurate, comprehensive, objective, and rational production of knowledge” (Harding, 2009, p. 191). Centering the insights of COMPUGIRLS as they critically assess the dominant culture, its digital tools, and their understanding of self may enable researchers and practitioners to understand the knowledge of the girls beyond stereotypic images of digitally disinterested females. Therefore, our analysis pays particular attention to what knowledge do the girls generate about the digital world and their social location as they increase their opportunities to gain mastery technical experiences in a culturally relevant context. We focus on the emic by prioritizing the girls’ perspectives. As a result, field notes from observations and interviews were transcribed and reviewed to extract themes and areas of convergence. Separately, we perused our notes seeking unified codes related to the effectiveness of our culturally responsive practices—asset building, reflection, and connectedness. Once we individually identified material from our data that exemplified some or all of these areas, we combined our data to detect themes. Our analyses suggest two primary themes that explain girls’ sustained motivation: thrilled by the challenge and technology as a controllable means. As a standpoint project, we further our analysis by considering how their critiques not only reflect important aspects of themselves as future technologists but also correctly complicate notions of girls’ of color technological aptitude and interest. Since standpoint projects are transformative (Harding, 2009), the following section reveals what the girls know and want to know emergent from a unique context while the discussion section explores how their standpoints can transform our scholarship and practices in more culturally responsive ways.

Thrilled by the challenge. In the first summer 2009, when the participants were asked to describe their motivation for joining the program, the most common answer is learn about technology. Interestingly, participants’ interests do not match their initial understanding of technology. Program recruitment efforts include either Scott or a COMPUGIRLS staff member hosting a pizza lunch at participating schools, presenting a video of past projects illustrating examples of all COMPUGIRLS media, COMPUGIRL graduates talking about their experiences, and the dissemination of our brochure highlighting pictures of girls working collaboratively with laptops. Despite such efforts, participants initially assume stereotypic ideas of technology. Based on their survey responses, technology exclusively means computers. Thus, participants believe the program “would let us play around with the laptops” or “teach you about computers, what’s inside.” The notion of collective work
is narrowly considered as most girls believed they would work individually. Although these perceptions are typically described as “boring” they did not depress the girls’ initial motivation to attend.

Sitting in a theater-styled college classroom, the participants quickly learn that COMPUGIRLS does not connect with their understanding of technology or learning. As the large movie-like screen descends from the ceiling and mentor-teachers ask the girls to attentively watch and listen to the surround sound displays of past projects, we encourage COMPUGIRLS to critique past work in order to consider what they will do for their projects. With nothing more than paper and pens, the students scan the room waiting for the laptops to emerge. After approximately 10 minutes of viewing, their perplexed gazes almost turn into disbelief as mentor-teachers request they share their ideas in small group. This interactive exercise is typically met with silence after the mentor-teacher asks seemingly innocuous questions, “What did you think about the video? What did you like?” By the end of the week, however, mentor-teachers are able to supplement these original interrogatives with more reflective inquiries such as “What would you do differently?” How does the video present the ideas of social justice?” In addition to learning how to identify peer-reviewed articles, participants are able to respond more thoroughly to “why” questions with supportive material. All accomplished without the use of individual computers, COMPUGIRLS shift their previous understanding of technology and come to understand that it includes interactions, “I didn’t know we’d have groups and different mentors.” By the end of this first week, groups have a written plan—known in academic circles as an abstract—that describes a problem statement drawn from their experiences, research question(s), design on how to gather data in answering the question, and stated significance for pursuing the topic. Lilian’s abstract on the social consequences of physical fights among high school girls exemplifies their work:

The population of women in gangs is on the rise and more serious than ever. Teen girls involved in gangs don’t realize the effects being involved in gangs creates and most of them only think of it as family and fun. But, they don’t realize the effects it has on others and themselves. In this research paper I will see how women in gangs are treated, looked at, and see themselves. I will also research the emotional, physical, and social effects being involved in gangs has on their lives now and in the future. Other things I will look at are the reasons why they became involved in this type of activity and also the discrimination they get from others and the discrimination they give back. This research paper will be all about life as women affiliated in gangs and the emotions it brings to women and the people in their community.1
At the beginning of each new course, we repeat this process as many COMPUGIRLS refine or change their topics, building upon their already existing knowledge. In part, mentor-teachers embed into the daily activities time for girls to provide peer critiques.

Their preprogram understanding of technology becomes far more complex: “Thought that they would let us play around with the laptops, turned out to be very descriptive.” At the same time, extending their technological knowledge so that they realize the multitude of computer programs is equally intriguing, “When I got here and started learning about computers and stuff like the podcast and the iMovie, I didn’t even know some of that stuff existed.”

The participants’ realization that they do not know a lot about technology was a shared experience by most, “I’m not very brilliant with technology, so I’d like to know more stuff.” As one COMPUGIRL admits, her lack of knowledge is a limitation but the program allows her to expand her understanding while also providing a worthwhile activity, “I knew I wasn’t going to do anything this summer so I thought I may as well do something good with my time. Then they came to one of my classes and they talked to us. . . . All I know how to do is go to MySpace, so I wanted to learn something good.”

At first, the study participants profess some shock and disappointment in not getting access to any technology until Week 2. For each of the courses, COMPUGIRLS spend the first week working collectively or individually on storyboarding, writing proposals, and establishing a research design for their projects. Mentor-teachers require each student to workshop their proposals in both small and large group sessions. No one in the entire cohort of 40+ receives access to the laptop until everyone successfully presents their proposal. Success is based on how well others believe a presenter articulates her ideas. Specifically, COMPUGIRLS assess each other’s plan on how well the proposal articulated a social justice perspective, organization of ideas, consideration of stakeholders, and professed interests. Once the audience is convinced and we provide laptops, the people before technology (PBT) rule emerges.

For some girls in our program, it is the first time they interact with laptops. Thus, their excitement is understandable. However, mentor-teachers facilitate conversations with participants to establish ground rules. Although the rules are mainly peer generated, we encourage the participants to consider the significance of people rather than the presence of technology. Emphasizing that creating strong bonds among group members—relationships that rely on authentic feedback, support, and encouragement—will lead to success more than being the most technologically adept, leads to the PBT rule.
PBT serves as the acronym reminding participants about a significant social rule; that is, interpersonal associations can increase COMPUGIRLS’ digital knowledge more than can individual interactions with technology. A COMPUGIRL advisor who also serves as a manager at an international technology company put it best, “When we recruit employees we don’t always seek the individual with the most computer training. We can train someone to work on our software. But we cannot necessarily train people to get along with others and collaborate.” The mentor-teachers translated this belief into practice prioritizing peer interactions over computational lessons. Consequently, an important COMPUGIRLS subtext is to create a community of collaborative friends through dialogue and critical evaluation. To accomplish this task, mentor-teachers may quickly say, “PBT,” to remind girls at a given moment activities such as listening to, providing feedback, and/or mentoring one’s fellow COMPUGIRL are more significant to building our community than allowing girls to search the web, playing with a digital camera, or building blocks in SCRATCH. Granted, approximately one third of the curriculum includes technical lessons that may or may not require peer interactions. The remaining two third of the curriculum, however, capitalizes on the girls technical knowledge to encourage interactions. Specifically, in the first three courses, teachers may engage in 15-20 minutes of direct instruction on how to use Garageband, for instance. During these lessons, we encourage girls to play with the technology individually. Afterwards, however, we request girls to share the results of their “play” with their group, provide suggestions and direction, and engage in conversations on how their newly formed technical knowledge relates to social justice and/or their research topic. It is during these exchanges that the interpersonal takes precedent and PBT assumes priority.

Articulating a well-designed research project and knowing the technology to present the project prove to be two of three layers contributing to the COMPUGIRLS’ motivation. Steps to accomplish both are typically quite methodical, but as 15-year-old Serena explained, the progression from their initial attempts to later iterations of their research is important for future goals, “We also learned how to outline our research paper. Because I did not know how to put it all together. Today they gave us an outline/abstract of how to do it. That’s a helpful tool because I’m going onto a university and we’re going to do a lot of research papers”. The girls recognize that what they are able to accomplish and do is noteworthy particularly given our expectations and their age:

My topic has developed and gotten more specific over the 2 years we’ve been in CGs (COMPUGIRLS). When you think about it, the majority of us are like
14- and 15-year-olds and we’re like researching this topic and it makes me feel like really smart. Mostly it’s because of that. When you think about it and you realize that you’re doing this big thing and you’re not that old or that mature, so it’s mostly for the experience.

Admittedly, we hold high technological expectations for the program participants. Although the media changes among the first four classes, we expect COMPUGIRLS to learn how to operate a camera and/or camcorder, manage and analyze survey data using surveymonkey, storyboard all ideas by hand or using PowerPoint, consider Prezi or the potential of an html website for presentation, compose scripts and perform video editing using iMovie, create a game or movie where she immerses herself into object-oriented programming paradigm via SCRATCH, and architect a virtual world using scripts and builds. For most participants, it is once they near the final course that they begin to see the value of wedding media lessons with research in order to increase the rigor of the experience. Esmeralda, a relatively quiet Latina girl of 14, put it best:

Before CGs I did not know how to use a computer. The first time we came and we had to complete a survey I was looking for the internet button. Everything we’ve learned here: APA style, citing and references, and how to research; I didn’t know there was google scholar and other resources aside from google. It’s work because we come here twice a week, but it is a lot of work, and it helps you out. It teaches you stuff you wouldn’t just learn anywhere.

The girls maintain a high-level of eagerness to complete these activities particularly when, as Madeleine, one of the few African American female participants stated, “You see the finished product, when we first saw our video—the final documentary. We had so much confidence in it, we’d already seen it on the laptop, but when they played it on the big screen it was really different. You could see the whole thing and after we saw it, I felt proud of myself.”

Viewing two sides of an argument to avoid bias or at least account for their a priori notions surfaces as a third layer of their experiences. Throughout the course of the program, we remind participants that there are always multiple perspectives to every topic and encourage them to consider the objectives of various stakeholders. Therefore, in both small and large groups, individual girls present their ideas and their COMPUGIRLS’ audience learns to both encourage the presenter and pose critical questions such as “How is your topic about social justice?” “What is your goal for using this technology to tell your story?” “What do you want to see happen as a result of your project?” At first, mentor-teachers need to provide the inquiries and model the
questioning behavior as most girls are unaccustomed to constructing these types of interrogatives. However, as COMPUGIRLS progress through the courses, they learn to develop their own questions for themselves and each other. Before leaving the physical classroom space, each girl submits to her mentor-teacher a notecard indicating what they thought about the day’s activities, what they will do with that knowledge away from COMPUGIRLS, and how will it influence their actions upon their return. At the beginning of the next class session, we ask the students to volunteer what they have done since the last class session, how satisfied they are with their progress, and what they want to accomplish in that day’s session. Often this incites a peer conversation and/or critique in which listeners will offer assistance, words of encouragement, or gentle chastisements (e.g., “You haven’t done enough! You will embarrass us.”). Despite such critiques, COMPUGIRLS quickly identify their own assets and potential, “I like working with Macs. It’s been fun. There were a lot of programs I didn’t know how to use all the way so being able to say, ‘Yes I know how to use imovie or garage band,’ and then make something with it was really awesome.” Receiving external feedback seems to have encouraged some individual girls to engage in self-critique as evidence by the following revelation, “Before I wrote my abstract in 10 minutes, then I looked it over when they told us we had to turn it in on the flash drive, and I did not like [it]. So then I took an hour to do it and I love how it is now because I did it from scratch and paid attention to what I was doing.” Such realizations develop a boon.

Perhaps due to the ongoing opportunities to articulate what they know but not be ashamed of admitting what they do not, participants realize that they entered the program possessing valuable skills on which to build, “I get to meet with all the girls; it distracts me from school work, here I get to talk more with them and ask for help, not like school.”

COMPUGIRLS, like Mya, distinguishes the program’s affordances from the formal educational constraints. As Mya explains, this recognition also includes identifying the shortcomings of the school context:

This program gives me something to look forward to. I can’t do this at school. They don’t have programs like this. At my school, boys get more than girls do. They have basketball programs, field trips, and mentor meetings. At the end of my school year last year, they gave us this program as an option. The boys went to a Suns games and we only had this one thing. And we took that as a reward to us for being there this year. This program is making me notice that I do know more than I thought I did. I have Macs at home, because my mom works with them and I help her out and I’m the youngest in the house. So I feel smarter than my older siblings.
Challenging themselves and stereotypes motivates COMPUGIRLS. Although program participants do not choose to specifically explore differential gender expectations as a project topic, they become more vocal and willing to point out gender scripts. For COMPUGIRLS like Calisa, understanding that society places higher expectations on boys to become digitally savvy does not deter her. Indeed, she becomes more animated as she explains how opposing these gendered expectations motivates her actions, “I think many people say boys can do a lot better in technology. Which I challenge myself in that, because I know it’s not true. That’s why I come here.”

The more complicated the technology and the higher the expectations, the more the COMPUGIRLS express their enjoyment. Often surprised by how quickly they learn a digital media or how well they synthesize information, girls beam with pride at their increased technological dexterity. By the third course COMPUGIRLS welcome the program’s challenges: “I think that this time it is harder and I think I’m enjoying it more because it’s more challenging, I challenge myself more this time than the other times.”

Girls who are quiet in the beginning of the program blossom by the end, providing one-on-one technical assistance to their COMPUGIRL sisters and/or readily volunteering to present their progress to the whole group. Not only are mentor-teachers seen as resources, but the girls themselves come to see each other and their self as significant sources of knowledge. In this context, they take pride and enjoy taking ownership over their work, their space, and the program. As a consequence, the technology becomes a means to an end.

**Technology as a controllable means.** The power of manipulation intrigues many participants, allowing them to research their topic in innovative ways. Christine, a 16-year-old African American COMPUGIRL, is keenly interested in the media’s effect on teen girls. Once she enters Course 2, she revises the idea of her final project upon learning SCRATCH’s potential, “With SCRATCH, we control how things are going to happen. And it’s sort of like a magazine because it’s changing . . . manipulating technology to mimic the media’s manipulation.” Many of her program peers share their exhilaration to use COMPUGIRLS media in ways that would make an impact on a broader audience. The possibility that people beyond their communities can interact with their projects via SCRATCH’s networks or Teen Second Life cause many participants to consider how the media already uses its vehicles (e.g., television, magazines) to manipulate images. They reason that they too possess the burgeoning skills to change the images people see and, hopefully, encourage social change. For girls like Jillian, change is a result of manipulating the technology in culturally responsive ways.
When 15-year-old Jillian wants to research sexual harassment within Latino families, she realizes from personal experience that respondents would be understandably reluctant to participate. Thus, her COMPUGIRLS teacher spends countless hours encouraging Jillian to pursue her topic by using culturally responsive methods (see for more detail, Scott, 2012). Jillian conducts many of her interviews in Spanish, capitalizes on her bilingualism and burgeoning digital skills to create her video documentary with English subtitles, learns to maintain confidentiality of respondents by blocking their faces in the video, and seamlessly integrates national statistics, peer-reviewed articles, and personal narratives to demonstrate how the dominant society attempts to depict sexual harassment as an issue more prevalent in urban settings than in White, middle-class contexts.

Integral to their feeling of control is recognizing that they have acquired technological knowledge that may exceed the talents of non-COMPUGIRL peers or teachers, “The [COMPUGIRLS] opportunity gives you with Technology; before this program I don’t even know how to use a Mac. Now I’m a freshman at the HS and all of our computers are Macs and I’m now one of the most experienced one in some of the classes. I take that to an advantage.” For some they feel an increase of control over their learning experiences in more formal educational settings, “I didn’t know I could do that for school. My teachers didn’t even know what Scratch is. And I told them what we could do in Scratch and they thought that was a good idea. And we should start doing that this year.” This realization is a result of a multitude of factors not the least of which includes the girls’ interactions with each other and mentor-teachers, “I come here and learn new things and meet new people and get help from mentors. And that’s what I like.” That learning is a collaborative process affects the conventional power dynamics perceived by most students. Near the end of the final course, Celia describes what many girls believed was the ideal relationship between a mentor-teacher and a COMPUGIRL, “We’re kinda on the same level as our teachers and learning new stuff from Second Life.” COMPUGIRLS provides a certain degree of freedom that the participants do not all face in their school lives, “When I found out that we were going to choose our own topic, I was really excited. I had already planned out everything that I wanted. I researched everything. So I was really excited knowing we would choose our own topic.”

Ensuring that their projects make an impact on their immediate communities assumes great importance for participants. By the conclusion of the 2-year period, COMPUGIRLS organize closing ceremonies that became a true celebration of both their work and their communities. Mentor-teachers provide participating girls a checklist of activities and guide them to create a planning committee, select mistresses of ceremonies, and develop an agenda.
Central to the ceremonial preparations is participants encouraging others on how to present their topics to potential attendees. Consideration of presenting information in multiple languages (e.g., Spanish or Pima), level of interactivity, softening of terms for highly controversial topics, and maintaining confidentiality of interviewees are issues they address all while maintaining a heightened sensitivity to wanting viewers to feel connected to their work in hopes that their efforts will cause change.

Typically held for an hour on a Saturday morning, aromas of homemade salsa, tortillas, and frybread punctuate the air; prayers said in Pima; Spanish-English translators; and an overall sentiment of joy paints the contours of these 60+ attended events. The girls send invitations to district superintendents as well as state congressmen professing pride in their work, and both large screen and small screen presentations occur. Integral to the event is each member of the program stating what she learns from the session. Esmeralda’s closing words continue to echo in many ears, “People do not think Latina girls can do technology. They think we really cannot do anything but get married. But because of COMPUGIRLS, we prove these people wrong.”

**Discussion and Conclusion**

A standpoint theoretical approach reveals how their seeming marginalization has not depressed their technical acuity, commitment to social justice, advocacy in their communities, or belief in self. Indeed, these elements increase within COMPUGIRLS’ culturally relevant context. The program presents strategies for the girls to explore different facets of themselves while becoming more computer literate. Certainly, the program is not the sole force in their lives leading the girls to the above perceptions. The impact of family and non-COMPUGIRLS peers on their developing consciousness requires further investigation, particularly by using qualitative approaches. What the data do suggest, however, is COMPUGIRLS serves as that meaningful experience allowing standpoint theorists to understand how underrepresented girls see the dominant culture, its practice of power, and potential to make changes using multimedia projects. It is this type of information that can bring about the necessary transformation standpoint theorists say is required for social justice ends. Culturally responsive computing practices as enacted through COMPUGIRLS context seem to facilitate this process.

This article’s findings foil the quantitative analyses exploring similar questions of this project (see Scott, Husman, & Lee, 2011). Simply put, we realize that lack of technological exposure does not mean individuals—girls from urban areas, in particular—are unable to see the value of technology.
The girls enter the program with relatively high perceptions of technology’s instrumentality for their community and they grow in understanding their selves as potential participatory members of the digital community. In this particular piece, the girls’ standpoints illustrated by their voices demonstrate the richness of their growing sense of self.

More important, no matter how challenging, girls gained a greater sense of empowerment with their activities as the technology and research demands increased. At the same time, they maintained a strong sense of commitment to communities leading to connectedness. Asset-building activities and multiple opportunities to dialogue with each other motive girls to continue on in this rigorous program. Seemingly, the uniqueness of the space and innovative pedagogical techniques prove to be very inspiring. Coupled with their increased level of seeing themselves as technological innovators, COMPUGIRLS becomes very attractive for them, although not entirely what they expected. The program dispels myths, and participants enjoy being part of this counterculture. No matter what the obstacle, girls take strength in their newfound connections and ability to manipulate digital media.

Culturally responsive practices do not include depressing standards or expectations. COMPUGIRLS takes this seriously but works hard to access girls’ repertoire of knowledge—that is, knowing what is “wrong” in their communities and requires action—positioning it as an asset. Providing digital opportunities and peer feedback become part of our explicit curriculum. Girls take pride in learning this skill and understanding the import of groupness. From this perspective, girls’ self-perceptions shift.

Over time COMPUGIRLS see their identities as contributory members of a digital community. Through regular occasions to reflect upon their knowledge and their topics, COMPUGIRLS understand the role of technology not as an end but a means to advance community. This powerful lesson is enhanced by their program’s experience as they interact with each other and various community members during celebratory events. Reflection is far from an individual process, and, in our context, it requires connectedness and social interactions. These activities are often considered antithetical to perceptions of technology—at least by the girls prior to entering the program.

More digital media programs aimed at underrepresented groups of girls may do well to embed asset building, reflective, and connectedness into their offerings. To avoid such elements may dampen the already extant interest of some communities, conflate the ideas of digital interest with digital opportunity, and simply position certain voices to marginalized positions. Our data indicate that COMPUGIRLS have much to say and are more than willing to expand their digital and research knowledge as long as it is culturally relevant with mentor-teachers and researchers actively engaged in actualizing culturally responsive tenets. More important, the participants are well aware of
institutional inequities and use our enrichment experiences to gain additional skill in articulating their burgeoning understanding. Unlike most schools, girls manifest their developing consciousness in digital and more traditional formats (e.g., research papers). We do not tolerate the belief that they cannot do something due to their raced, gendered, and classed positioning, although we fully understand the potency of structural barriers. Avoidance of such deficit thinking allows us to provide mastery experiences rarely afforded in their underresourced schools.

We challenge others and ourselves to ensure such efforts are sustainable. To this end, we must create more informal and formal educational opportunities for girls from urban contexts to become digital innovators and voice their understandings in nonthreatening, but rigorous, culturally responsive, environments. While our findings pertain to a relatively small participant pool, we remain optimistic. At the least, COMPUGIRLS illustrates the impact culturally responsive practices can have. The long-term effects require further study. Nevertheless, if more urban-based enrichment programs initiated their efforts from an asset-building, reflective approach that encourage genuine connectedness, we may be able to create a critical mass of technologists for the future. For our future success should not be limited to how many computer scientists our society creates but how well our citizens use technology in innovative ways.

The most salient capital for this digital economy is innovation. If our nation is serious about narrowing digital divides, we must consider how to increase such capital not only for how it will benefit computer science but society in general. This standpoint approach allowed us to challenge the taken-for-granted notion that some girls are not interested or motivated and produce naturalistic data revealing important lessons of intersubjectivity and digital media. Our culturally responsive strategies assisted us in providing experiences that capitalize on this interest. We encourage more scholars to use a standpoint methodology that may lead to more nuanced questions of engagement and exclusion. Practitioners may do well to consider culturally responsive computing as a means to defeat the storms of digital disparity.

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