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Beyond Coding: Using Critical Computational Literacy to Transform Tech

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Youth Radio

On a Tuesday afternoon in downtown Oakland, seven teens stare intensely into their laptops and type furiously on their keyboards. After a full day of classes at various schools across San Francisco's East Bay, these teens work diligently until 6pm on the third floor of Youth Radio, a 25-year-old youth-driven production company. On this particular afternoon, the young people are figuring their way through the finer points of HTML.

This image of teens on screens may conjure up similar scenes in any number of computer science classes in school-based and after-school coding programs around the country. What is not visible in this moment are all the pedagogical and curricular moves that take place before and after to connect young people's computational skills to their growing capacity to critically examine social conditions and express civic voice and agency in a complex world. That context is essential to understanding how Youth Radio Interactive works. Interactive is the division of Youth Radio--a national network of next-generation journalism, storytelling and arts--where young people combine coding, design, and reporting to create mobile apps, games, maps, online quizzes, infographics, and other digital content. The projects that the Interactive youth team develops in collaboration with professional designers and developers have been distributed via Google Play, NPR, The Atlantic, and Teen Vogue. Their media products challenge audiences to engage with some of the most pressing issues of our times, including gentrification, sexual assault in schools, the lived experiences of LGBTQ+ youth, and the mental health struggles of urban youth of color.

Over the past decade, public and private organizations have backed significant growth in computer science pathways for youth. In 2016, former President Barack Obama launched *Computer Science for All*, a program aimed to provide opportunities for kindergarten-through-high school students to learn "the computational skills they need to be creators in the digital economy, not just consumers, and to be active citizens in our technology-driven world… computer science is a 'new basic' skill necessary for economic opportunity and social mobility." Who would argue against preparing youth to become digital-age creators, all the while giving them the necessary tools for social and economic prosperity? Groups like code.org, Code Academy, Girls Who Code, and numerous other local and national organizations that host hackathons, bootcamps, and classes across the US have emerged to pursue these same goals.

Many of those driving this push to teach "code for all" have operated under a vision of "techequity," which seeks to increase the racial/ethnic and gender diversity of the highly homogenous field of computer science (CS). From the AP Computer Science A test-takers at the secondary level (Erickson, 2016); to bachelor, masters, and doctorate CS recipients (Zweben, 2010); to the demographics of the top 23 major technology companies (Desjardins, J., 2017); there continues to be an underrepresentation of women, Black and Latinx people throughout the CS pipeline. But in the last few years, some researchers (Lee & Soep, 2016; Nasir & Vakil, 2017; Sandoval; 2017; Vakil, 2014) have recognized that diversity is not sufficient. Simply adding more melanin to the workforce does not combat the roots of institutional bias and historical oppressions faced by qualified women and Black and Latinx employees. Unless educators, policy-makers, advocates, and industry leadership directly address the structural conditions that result in poor recruitment and retention rates among underrepresented groups, the tech industry will continue to lose women and people of color. Moreover, there will continue to be a dearth of pathways for young

people looking to apply tech know-how to the full range of civic, expressive, and professional activities that give meaning to their lives and sustain their communities.

While Youth Radio Interactive teaches youth to code, we do so not in the simple spirit of "code for all!" but driven by the question, "code for what?" (Soep & Lee, 2016). What investigative, imaginative, critical, and practical problem-solving abilities do young people need in using code to transform institutions that too often fail them and their communities?

At Youth Radio, we build on the well-established scholarship of culturally relevant (Ladson-Billings, 1994) and culturally sustaining pedagogy (Paris & Alim, 2014) by creating a learning ecology that values and leverages the prior knowledge, experiences, and backgrounds of our youth, while fostering the rigorous skills necessary to produce high quality media that reaches audiences in the tens of millions. At the same time, our youth are pushed to address relevant and critical issues in their communities with a deeper socio-political awareness than many mainstream media products. In the daily workflow of the Interactive department, there are not separate times in the course of a class dedicated to technical factors, versus design-oriented decisions, versus judgments about the critical impact of the products the young people are creating. Rather, the teens and their adult collaborators tend to move across these considerations as they advance throughout the production process. By weaving critical media literacy pedagogies (Morrell et al., 2013) into our practice in this way, we prepare young people to go beyond a surface-level analysis of the products they consume and to hold themselves accountable for the impacts, intended and otherwise, of the products they create.

Young people enter Youth Radio's free, after-school Oakland program from surrounding schools, cycling through one three-month course in which they learn the basics of multimedia production, supported by deep-dives into critical media literacy (Garcia, Mirra, Morrell, Martinez, & Scorza, 2015) as well as academic, health, and career support services. A second three-month course invites teens to specialize in one area of primary interest, and once they complete that session, the young people, predominantly youth of color and low-income youth, are eligible to apply for paid internships across the organization. They work as peer educators, reporters, commentators, music producers, engineers, and key members of digital publishing, marketing, art and design, events, and communications teams. These six month internships provide the basis for the work of those who enter Youth Radio Interactive.

Bringing History Alive

One example can be seen in the creation of a recent project titled "Little Rock Nine Live (#LR9LIVE)."[1] To commemorate the 60th anniversary of the desegregation of Central High School in Little Rock, Arkansas, a group of current Central High students who were part of the Little Rock Central High Memory Project connected with Youth Radio to create a social media re-enactment of that historic day. With interviews, hand-drawn illustrations, and archival tape and photos from the original Little Rock Nine (LR9), the young people issued this provocation: If Twitter were around in 1957, how would the Little Rock Nine story unfold? Also, how do the themes and conditions of the original Little Rock Nine remain relevant to racial inequality and school resegregation today?

D, an Interactive designer, was asked to create color portraits of the nine historic civil rights leaders as a part of a website team. Teresa, D's supervisor and a senior digital producer at Youth Radio, had known of D's experience creating portraits, both digital and hand-drawn artistic representations of people. D's approach to creating the portraits seen at the bottom of the screenshot below (Figure 1.) highlights a concept we call Critical Computational Literacy (Lee & Soep, 2016). It combines the strengths of critical literacy to examine, highlight, and create products

[1] See https://yri.youthradio.org/littlerock9/

that seek to unmask unequal power relationships and ideologies while utilizing computational thinking practices to design aesthetically rich, culturally sustaining products.

Figure 1. Title screen from Little Rock 9 Live Tweet

D acknowledged learning about the LR9 in high school but did not remember the nuances of this historic event. When asked why he and the team chose to create original color portraits (rather than simply reproduce the archival black and white photographs supplied by The Memory Project), D stated:

> Imagine folks were at Little Rock Nine, and people on Twitter could actually interact with it. I would guess having it more black and white would kind of make it seem like a long time ago… you're trying to make it more… alive, like today."

Pressed further, D describes an exchange with Teresa about how the audience would be "reading this and you're kind of feeling like you're living through this or you're experiencing it." D performed an Internet search of existing images of the LR9 from 1957. There he found some black and white photographs with all nine students. As an artist attempting to create color portraits of each civil rights leader, he was stymied by the quality of the available images. As he described it, "the young pictures, there wasn't... a lot for me to really work with. I just had to work with my eyes for the highlights and shadows and stuff." He compared it to contemporary images that had nuances and complexities in color, highlights, and shadows that were just not seen in the original 1957 photographs. In order to overcome the limitations of the archival images, he began searching for additional, more recent images of each of the LR9 students, now adults. He ended up using a combination of their pictures, from their teens to their 40s, to best represent who they are. As D described,

> I wanted them to look good. I don't know if any of them has passed, but if they look at it I want them to be like, 'That looks like me, that looks good.' Or just people who actually know who they look like, I want them to be able to just look at them and say, 'Oh my gosh, that looks exactly like them,' or close to like them.

Black (Complexion) Representation

Another challenge D faced was accurately portraying the wide spectrum of skin tone among the members of the LR9. For people of African descent and other people of color, accurate representation of their varied hues has been problematic. Whether the cause was mechanical, technical, or cultural seems almost inconsequential. Traditional photographic technologies were not made to record black skin: narrow ranges of film emulsions were calibrated for white skin; light meters underexposed dark skin; and Kodak's smaller film-developing units or Shirley cards, named after the white model, standardized her whiteness as 'normal' (Cole, 2015). More recently, web cameras from HP came under fire when their face recognition tool was unable to detect black faces (Cole, 2015). Beyond the engineers and inventors who created tools without consideration of dark-skinned people, are the numerous examples of "editorial licenses" to manipulate black faces for their purposes: Time Magazine's darkening of OJ Simpson's mugshot or the lightening of black faces in advertisements (Keenan, 1996).

Challenging this long history of lightening black people's skin tones and ignoring the diversity of colors struck a chord for D. "I didn't want them all to be just the same color. You can tell in the black and white photos that they're not all the same color." Though D's approach grew out of his awareness of the politics of representation, his ability to implement that approach required a technical plan. To accurately create the portraits, D first used the original 1957 photographs of the entire group to create a pigmentation scale. Then, he searched for more recent color images of each individual from the group. He noticed that some members of the LR9 were better represented than others through his online search. D deliberately used earlier pictures of them in their 30s and 40s as a benchmark for producing an average of their skin tone. After whittling down to three color photographs, D would choose one to use strictly for color. He would upload it into Photoshop and use the photo as a reference on the left side of the screen. On the right, he would begin drawing the outline with a brush tool, then slowly lowering the size to one or two pixels (for more detailed outlining). He would continue to use the original photograph (on the screen) to determine the background layer, outline layer, and base color he would use for each member of the LR9. Even after completing all nine portraits, D would go back to the original photographs to ensure he had accurately represented their pigmentation.

Critical Computational Literacy

Like many of our projects at Youth Radio, LR9 Live was on a tight timeline. What spurred D and Teresa to engage in the lengthy process of accurately representing the members of the LR9? If our decisions are simply made based on efficiency and simplicity, they could have easily cropped the black and white stills of the LR9 for our website and Twitter feed. If our team had been ignorant of the historical legacy of the misrepresentation of Black people based on photography tools and techniques centering white faces, D would not have gone to the great lengths to create a pigmentation scale and the additional research for color photos of the LR9. Central to Youth Radio's mission is the telling of stories and perspectives of populations who contend with multiple systems that drive inequality. It is in the very fabric of every department. We routinely ask ourselves and each other: How do we want this to be represented? What perspectives might we have omitted or ignored? Does this piece reify or interrupt dominant perspectives? What potential consequences might there be for the authors of this public story?

What D demonstrated here is a pedagogical and conceptual framework we have named Critical Computational Literacy (Lee & Soep, 2016). In this case, D leveraged his artistic talents with design and portraiture to create a product that counters the technical limitations of photography

tools in 1957 as well as practices that extend to the present. This allowed him to reimagine and re-experience the world of the Little Rock Nine to a new audience through social media (Figure 2).

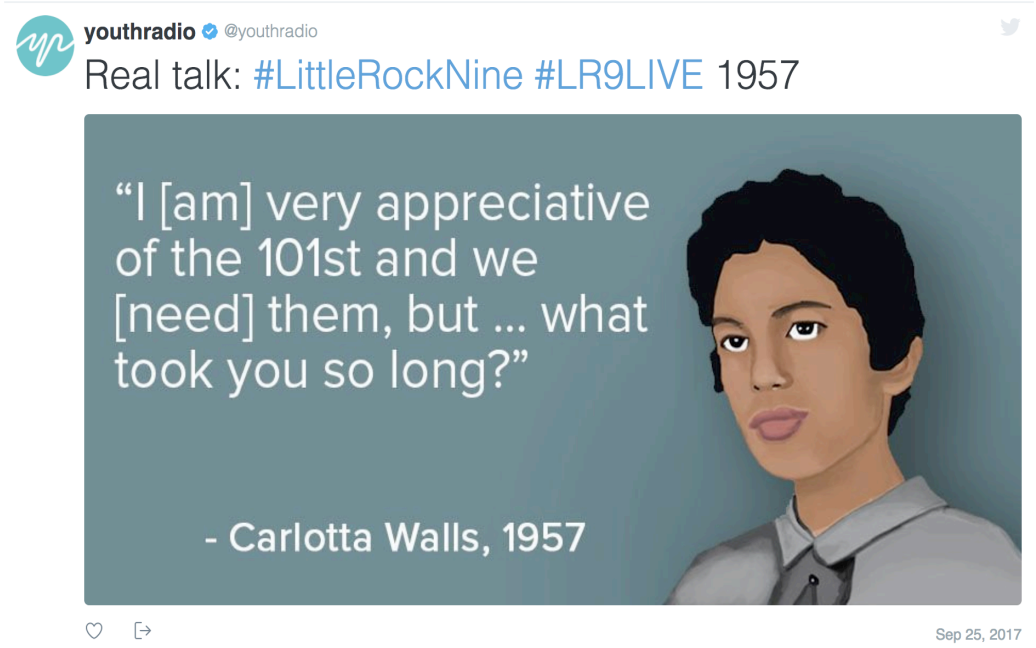

Figure 2: Screenshot of tweet sent by Youth Radio during Little Rock 9 Live Tweet

Additionally, this assignment had a depth of meaning for D. It tapped into his passion and artistic talents in creating portraits that genuinely reflected the essence of his characters. He thought deeply and worked diligently to create an artistic likeness that would be seen in a highly public product. This project tapped into something more profound for him as a young black artist and student whose life has been shaped by this event and set of characters he worked so hard to capture. As D states,

> I did nine portraits, so that was really exciting, but then it's connected to my history. These are like my ancestors. It was pretty cool. Because this is Brown versus Board of Education, so I felt like I was kind of reliving that too, just because as I'm drawing them, I'm going back into history and restudying everything they did… With this project, it really made me tap in, and it really made me get to know each person as I was drawing them.

How do we create curriculum and pedagogy that facilitate students "tapping in"? What would it mean to offer projects that went beyond teaching the technical know-how of digital tools? How would it change the institutional practices for tech companies and learning institutions if opportunities were given to complexify why you are creating this product and whom it benefits or hurts? Beyond training programs to recruit more women and underrepresented groups into technology, have the structures and systems been created to value and nurture practices that are not from a dominant perspective? If recruiting and educational organizations centered the experiences of historically marginalized populations and built environments where their full selves could thrive, we'd see transformation in the lives of tech makers, and in the products they create.

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