Conclusion: Falling Through the Leaky Pipeline?

> As he spoke, the whole city was broken like a honeycomb. An airship had sailed in through the vomitory into a ruined wharf. It crashed downwards, exploding as it went, rending gallery after gallery with its wings of steel. For a moment they saw the nations of the dead, and, before they joined them, scraps of the untainted sky.
>
> – E. M. Forster, "The Machine Stops"

Zeus got out of the Army in March 2022. He had to readjust how he behaved, spoke, and thought in civilian life. Zeus was already familiar with shifting his language and body movements, so he was a recognizable regular citizen. In Clearwater Academy and after he graduated to work in design and volunteer to teach kids, Zeus had learned how to be "in a corporate environment." The Army stripped away those mannerisms and turned him into, in his words, a dog, a cub in a wolf pack. Zeus held onto his desire to expand his digital literacy practice. As noted in the Introduction, he had signed up for an online class in cybersecurity and read books for certification in Texas in a hot oven (the tank). His squad mates laughed at him: They didn't understand why an Army grunt needed more academic education, why learning anything other than what the government told him to learn was so important to Zeus. He was a little taken aback that these farmers and construction workers would denigrate his desire to learn. But he later reflected on the lessons he could learn from these children of blue-collar families turned into soldiers: despite a rough family life where his sister carried the financial weight of their mother and father while Zeus was out doing his "ratchet thing," he had some privilege. Zeus felt his privilege acutely when he returned to Sakowin and met old friends, who "were once part of a royal family, but the viciousness of a cousin or something, they took all the money or something like that. And now they're back at trying to pursue their own life. They didn't agree with the culture of their family." By the time we spoke again in January 2023, Zeus' family was doing well: sisters graduating from college, cousins having kids, siblings buying houses. Everyone including himself was doing well.

Zeus' friends made fun of him for wanting to learn but that didn't stop him. Zeus reenlisted with the National Guard (Russia's war on Ukraine, which had officially begun on February 24, 2022 scared Zeus; he was afraid he would

be stuck in a tank in the war) and began Advanced Individual Training in information technology (IT); he had not received security clearance yet so he couldn't watch IT workers use software like PowerShell, a scripting language for managing digital infrastructures, but Zeus could continue working with hardware like telephone and internet cables, wires for fire alarms, and preparing military vehicles for missions. A few days after our final interview, Zeus would be heading to Arkansas for what the National Guard called "a gentlemen's course," not basic training with boots in your face but classes like West Point: desks, computers, clean floors, and good air conditioning and heating. His pathway was already scoped out: Zeus planned to attend college in Sakowin and major in engineering and then capitalize on that knowledge for cybersecurity and community engaged work. Coming into Clearwater Academy in 2017, web design made sense but now, he said, the landscape had changed: it's not enough to build and design software; there's a huge market for protecting software. Ukraine relied on drones against Russia's army, Zeus noted, but ninety percent of those drones could be taken out by cyberattacks. Some drones gather intelligence—photos, video, and other kinds of data. They are flying computers, and like any flying computer, they have hardware that could be exploited by hackers. From his high vantage point in just military training, the world had entered an information war. People like himself must be on the frontlines. Zeus described coding literacy as a moving target, always responding to the needs of the market, of the economy, and national security.

He found a middle ground between the corporate environment Clearwater Academy trained him for and the wolf pack mentality of the Army. In that middle ground, he could use the full repertoire of his knowledge to protect national cybersecurity on one hand and teach future generations IT and web design. His professional life and academic training would circulate to the communities that funded his work through public tax dollars. What fueled his resolve, it seems, was the example Clearwater Academy set for him. As Zeus explained in Chapter 2, he could be a master of tech and now he could one day help others become masters themselves. Thus, the value of Clearwater Academy wasn't that it got him a job or that he could join the rank and file of white digital technology design; the value was changing his perspective on his life and the life of others, finding the wholeness of people around him, and that technology at its very best augmented those assets. From that perspective, Zeus understood Clearwater Academy was an organization for philosophical relief in addition to financial and social support. As he told me in our interview, "Dude, I'm telling you, man, Clearwater Academy really changed my life, dude! Clearwater Academy really changed my life, and everybody that I know, I refer them to like, every time like I run into someone that's struggling, I always say Social Justice Cooperative (SJC) or Clearwater

Academy." For me, Zeus had "discovered how [he] can develop and use technology not merely to fit within extant social systems but as means by which to construct new and emancipatory social systems (Scott & Elliott, 2019, p. 377). Critical imagination for coding literacy makes real the emancipatory social systems many Black people have strived to create.

Black Coding Discourse Reveals Black Tech Ecosystems

Computer code bootcamps respond to a new yet familiar call for more computer science education. The initial target of the movement is K-12 curricula adopted from state to state. While I question the logic that a software development crisis persists, I do think there's a *desire* for more software developers. Writing now in 2024, the advent of generative artificial intelligence pushes tech companies to compete. Following the logic of Silicon Valley dating back to the emergence of information technology driving global competition, these companies need to move fast to survive in the knowledge economy; calling for more experts in generative artificial intelligence and machine learning to drive innovative design makes sense. A desire, not a crisis. Nevertheless, expanding computer science education becomes a national effort that computer code bootcamps join. With intensive training based on the exact needs of the tech industry, computer code bootcamps meet the demand for more developers and other highly skilled technology positions. They can also target marginalized people, as the call for more coders coincided with intense scrutiny of diversity in the tech workplace. A host of disenfranchised and abandoned poor people await to meet the call. People like Zeus accepted the narrative that social mobility awaits; it's not just money that makes the bootcamp attractive nor the swift training: computer code bootcamps may appeal to marginalized people's already existing interest in tech but they never had the resources or time. Coding literacy and the social, material, and cultural structures that make coding literacy thrive can't carry the burden of solving poverty and racism. Coding literacy scrambles poverty around, at best, and then poverty returns to its original shape and size. However, I have argued that coding literacy—its unique processes for problem-based composing, its cultural practices embedded within tech companies and Silicon Valley specifically, it's emphasis on problem-solving and clear ideation of mental models for software, and even its attachment to whiteness—do reveal new truths about Blackness and computer programming.

I've argued in this book that if researchers, teachers, and sponsors interested in computer code bootcamps pay attention to what's happening on the ground for Black adult learners, they will find Black coding Discourse—the social languages used in conversations about coding literacy and its

sociocultural values and material tools that arise from practicing and doing computer programming. They interact with the ways of being and doing computer programming according to local majority white tech companies' figured worlds. I used the tools of qualitative research—interviews, participation observation, field notes, and collected literacy artifacts—to understand what this Discourse means for them and what they might imply for teaching emerging technologies in adult education. As they try to cross into a professional life for social mobility down a so-called tech pipeline, Black adult learners' experiences in computer code bootcamps illuminate other possibilities, desires, and needs not afforded to the coding literacy practices learned in Clearwater Academy and mismatched from the stated goals of many computer code bootcamps: social mobility and, for Clearwater Academy, addressing racism and poverty. My analysis of Black coding Discourse reveals that beliefs in coding literacy and interacting with its unique logics send significant Black assets to the surface that would not have been clear otherwise. These assets make up Black tech ecosystems—an ever-evolving environment where Black people develop a variety of knowledges, practices, and frameworks for navigating a computer code bootcamp and the software developer profession. Instead of traversing a leaky tech pipeline, Black people express communal coding literacy practice that might lead to adjacent career, opportunities, and relationships outside of Silicon Valley-inspired tech companies local to Sakowin and more holistically fulfilling than just social mobility. Across four chapters, I've tried to identify logics in Clearwater Academy that seem to promote anti-oppression or inclusivity and show how that may be deepened according to the logics that animates a Black tech ecosystem. Those logics include using low-waged work and technophilia to develop new work ethics that computer code bootcamps should fulfill; deep understanding of oppression to motivate carework in coding cultures; acknowledge computer code bootcamps' role as racial organizations using career training to uphold racial social order; and discovering the variety of ways coding literacy may add to their Black lives while being fine with moving on to other literacies that seem more promising. Taken together, Black tech ecosystems bring some reality to the coding literacy myth in popular discourse.

In Chapter 1, I revise the value of literacy work histories that show only low-waged work. Although Black women and their resumes may suggest they must be trained from the ground up because they have no computer programming or tech workplace experience, these adult learners show a rich conception of work ethics. Their technophilia throughout life coincides with harsh relationships with low-waged work opportunities that sent mixed messages about their worth as employees. The six Black women's literacy work histories I describe and analyze also show how some work constrained their

relationships, continuing a legacy of stripping Black women from being mothers and exploiting their bodies for white supremacy, in some ways mediated by the computer code that creates oppressive software. Years of gender and racial domination according to their labor helped Black women in this study make up an informed work ethic for technology that they expected Clearwater Academy and the opportunities attached to coding literacy will fulfill.

Chapter 2 addresses the limitations of diversity, equity, inclusion, and belonging as a response to histories of oppression and exclusion in tech. In Clearwater Academy, Black coders use carework to maintain the web of relationships needed to learn computer programming and build their digital literacies through these programs. Black adult learners sacrifice their life responsibilities that keep them afloat: work, healthcare, reliable transportation, and housing all get thrown influx under the intense curriculum of Clearwater Academy. Although SJC provides some social service, they did not have the resources to fully address the conditions of poverty: within the computer code bootcamp powerful care labor flows from person to person, and what drives that care as an asset is full knowledge of one another's struggles with systemic oppression. Carework goes far deeper than surface-level, quick practices of diversity and inclusion that more likely hides whiteness than confronts it. Taking stock of how oppression flows throughout coding cultures names bigotry and transforms workplace practices and relationships for justice, correcting racial inequities in collaboration with marginalized coders.

Chapter 3 reframes computer code bootcamps as racial organizations, not merely training programs. They take in the logics and standards of tech sponsors, and the software profession in general, and design curricula and assessment practices accordingly. As a racial organization, computer code bootcamps withhold and reward material resources for coding according to racial schemas defined by whiteness. Computer code bootcamps like Clearwater Academy have a foot in two different places that are always in conflict: social justice on one side and market logics of whiteness on the other. What ensues for instructors Richard and Jessica and the Black adult learners is a struggle for maintaining agency over their lives as Black coders. Their sometimes conflicting ideas on coding's value reveal philosophical agreement that Clearwater Academy unwillingly participates in a project to turn Black coders into unproblematic, disciplined functions for white tech industries. Adult learners imagine figured worlds separate from majority-white tech companies, one that's communal in nature and not totally subservient to racial capitalism.

Finally, Chapter 4 follows the attempt to break into software development post-graduation. Most Black adult learners in this study hit barriers: plenty of work opportunities but they do not have enough experience. Taking care of family and finances was more important than getting a job in tech; it was

faster to get a job somewhere else—working behind the scenes as a cook or as a document designer. Although presented as a powerful and unique literacy that could deliver big advantages, computer programming was more boring than amazing, more tedious, and harder than what it was worth. Job interviews and internships were locations of intense judgements on the worth of others, and those judgements hurt. Hard. Microaggressions and unacknowledged assets accelerated the sense that their worth as coders wasn't as valuable after all. The doors closed in their faces, interns strategized new pursuits, taking the conditions of labor into their own hands against a labor market not readily welcome to them. Coding literacy echoed in their personal lives and non-tech careers: organizing household chores, mixing graphic design with web design and entrepreneurship, and starting a business in user experience design. In short, the knowledge and processes of computer programming moved elsewhere or not at all.

Clearwater Academy instructors call the program a worksite, not a school. Their assessment model examines not only technical knowledge but workplace behavior. Black adult learners practice being good workers as coders; this model makes sense because coding literacy in a computer code bootcamp has a tight trajectory: learning to work. A common model for many computer code bootcamps. My analysis takes SJC at their word, then, and I interpret Black adult learners in this study learning to labor with computer programming. If I frame everything as human capital creation against the forces of racism and poverty, I find that we may miss the Black coding Discourses that construct their Black tech ecosystems. What matters more than coding literacy practice and knowledge is *what they get from the experience*: an opening up of how technology works in their lives and what they must do to, in the words of Zeus, master it. While these adults could have done any other kind of training, like going to college for IT, the coding literacy practices here provide deeper insight on how to construct their relationship with technology and work because of professional and cultural expectations not always shared with help desk support. In short, I discover they have new assets that don't fit onto any résumé or cover letter, that steer away from training for human capital whose value is understood best through an exchange of work for compensation.

The professional goals Black adult learners in this study imagined for themselves may sound like they carry on a capitalist logic; to make it in this world you must play the game. In her book *Desire for Literacy: Writing in the Lives of Adult Learners*, Lauren Rosenberg (2015) notes that adult learners ally themselves with opposition, which "remains attached to dominant ideology, in contrast to disruption that accompanies resistance" (pp. 5–6) Resistance seeks new power structures for race and class. Opposition means

survival within existing hegemonic order. Rosenberg examines how this allyship comes more from feeling the competing pressures between opposition and resistance. I think this study—especially Chapters Three and Four—extends this notion. As Kevin noted, it's hard to rectify inequities for Black people when their advancement relies on the interest convergence of white tech sponsors (Bell, 1980). However, when participants state their professional career interests post-graduation, they rethink how technology really works in their lives. Kevin leaves behind the gospel of coding literacy for a humbling and challenging career in child services, or Rosie deploys her digital literacy—not coding literacy—for community engaged work that supports Black women and Black women with lupus in Sakowin. Economic pressures do and sometimes do not flow through their literacy practices. Not disavowal of racism or capitalism but also not belief in its supposed benefits.

The power to make real change in tech may require more strategic thinking than what some can do. Alice had a family to support; DeAndre had to catch up on rent. Gerrard had a clear vision for creating a community for Black people by using his business knowledge and earning power as a venture capitalist. And a broadening industry of black talent does exist as accounted for in new media publications like *People of Color in Tech*. I find people like Gerrard carving out a space for themselves separate from Silicon Valley, even though their technologies partly rely on Silicon Valley's many services. Nevertheless, they invert priorities—themselves over white users. I do not mean to cast a pessimistic view on changing how tech works against Black people and other marginalized groups; I do think, having spent eight years studying computer code bootcamps for this book, *change is hard*. But most Black adult learners felt less communal responsibilities to others and more love and care for themselves and family. When they do feel that communal responsibility, they turn to Clearwater Academy; Clearwater Academy will set you right. They will help you. Knowledge about coding literacy circulates in these ways among Black adult learners in this study. Clearwater Academy stands as beacon for other low-income people of color and women. Their trust is well-placed it seems. In 2019 Clearwater Academy expanded its model in other cities.

A Critical Imagining of Coding Literacy Futures

What do these findings mean for the current coding for all movement and computer code bootcamps? Education and training for work is a fair goal in a capitalist society. As a I tell my adult learners in my professional and technical communication courses, I understand that you must feed yourself and your family. Perhaps community engaged work doesn't look very profitable. But

private industry and community engagement can overlap as a civic technology project (Harrell, 2020). For practical policies and curriculum, I imagine a coding literacy education that helps Black adult learners reveal ways that digital technology augments their existing lives. Rather than a project for laboring to labor with coding literacy they imagine multiple ways coding literacy can flow in their lives, even if that makes navigating the job market but only an *option*, an option with lots of caveats. Rather than a conveyor belt of workers, consider how literacy opens, how it flows, and Black people may flow with it.

This implication aligns with the early movement to expand computer science education in the 1960s. Mark Guzdial (2021) gave four keynotes in which he argued that "computer science was originally invented to be taught to everyone, but not for economic advantage." Well-known scholars in computer science like C.P. Snow, Peter Naur, and Alan Perlis advocated for a computer science education that decisions over how software is created and used should not be left to a few powerful people; for the sake of democracy, all people should know about the inner workings of computer science (Vee, 2017). Guzdial (2021) writes that computing education for work is "important and useful, but often eclipses other, broader goals for learning computing. … Computing for everyone is likely going to look different than the computing we have today which has been defined for a narrow set of goals and for far fewer people than 'all.'" His *Learner-Centered Design of Computing Education: Research on Computing for Everyone* (Guzdial, 2015) outlines a clear picture of what coding literacy looks like for multiple uses across the human experience. His work exemplifies my point here with a tighter focus on Black experiences and digital technology. Overlapping with this broader goal for computing for everyone would be teaching computer programming through a critical race technology theory framework (Tanksley, 2022, 2023). Under this perspective, computer code bootcamp curriculum resist positive stories about technological progress. They would not necessarily teach critique but rather draw out and draw on Black people's existing thoughts about digital technology and address how technology supports whiteness and white supremacy. They become critical makers positioned to seek new approaches to design that's collaborative and social-justice focused.

Second, the caveats for going into tech while Black are stern warnings about ecologies that make up tech industries: computer science programs, computer code bootcamps, extracurricular activities for youth, and tech companies are all implicated in coding literacy for capitalism. Tech sponsors could do their own interventions. Racial capitalism structures our lives, determines who gets ahead and who doesn't. Labor participates in that decision-making. Put simply: the culture doesn't work. Teaching the ways the tech industry supports, collaborates with, and instigates existing systemic bigotries in

a computer code bootcamp perhaps matters more. There are books written in clear accessible language that accounts for these vast disparities in tech. Rather than call in Black people to be coders, call out those industries tightly winding racism and whiteness around computer programming. Other bigotries like sexism and heterosexism determine how marginalized coders move up or down the ladders of success. To break occupational segregation is to center marginalized people. Corporations are not new to adapting to "outsiders" and "misfits." Coders themselves were once seen as an unruly, unkempt, and socially awkward group when their professions took off in the 1960s. Tech journalist Clive Thompson devotes a chapter in his book *Coders: The Making of a New Tribe and the Remaking of the World* to the many personal, emotional, and mental characteristics of coders and how they work together in office settings, for example, and even continues to note the personalities of famous coders throughout the text. Ironic that tech sponsors and employers tell Clearwater Academy that they train marginalized people unprepared for their offices when they have gone from being outsiders to being the main drivers of our digital lives. However, until tech cultures re-tool their flexibility for Black coders, we may look to a new model of computer code bootcamp that assists in evenly distributing Black talent across the sectors of tech, from design to product management to maintaining software. This new focus on promoting Black people's broad participation in tech, not just computer programming alone, would reimagine the coding for all movement as the tech for all movement.