BY WILLIAM KIST

Our Gutenberg Moment

Embracing the Links between Computer Science and the English Classroom

"This is our Gutenberg moment," said Ernest Morrell during a recent webinar series sponsored by NCTE and United Way of New York City (UWNYC). "Much of the power to make, create, to code, and to invent rests in the hands of everyday people, and this is a huge shift. What kinds of tools are we going to need in our classrooms?"

Dr. Morrell's comments came during this spring's Read & Write + Code (RWC) Fellowship webinar series, which highlighted the connections between computer science and related technologies and ELA spanning an arc of reading, writing, and coding. The series was moderated by United Way of New York City's Vice President of Education Tom Liam Lynch, who stated, "Literacy is a civil right and a workforce necessity. In today's digital world, literacy begins with reading and grows from there. Literacy must also include teaching young people how to communicate their ideas to real-world audiences. When communicating to a human audience, we call it writing. When communicating to a computer, we call it coding. The Read & Write + Code Fellows are exploring together how to better leverage computer science in the English classroom as a way to both deepen existing literacy instruction while also democratizing access to computer science."

> "Think about what [coding] means for those who can speak this language . . . It's a language of power. It is a different kind of creativity, a multimodal creativity, moving from consumption to production."
>
> —*Ernest Morrell*

There can be no doubt that the definition of *literacy* is inconstant and has been greatly influenced by advances in technologies. A fluid, broadened conception of

CONTINUED ON P. 20

 continued from p. 19

Ernest Morrell

Grace Bonilla

Tom Liam Lynch

literacy has long been espoused by NCTE, going back to the 1920s when articles in *English Journal* advocated for using the then-new medium of motion pictures in the English classroom. NCTE's position statement from 2019, *Definition of Literacy in a Digital Age,* well articulates the organization's current stance:

> Literacy has always been a collection of communicative and sociocultural practices shared among communities. As society and technology change, so does literacy. The world demands that a literate person possess and intentionally apply a wide range of skills, competencies, and dispositions. These literacies are interconnected, dynamic, and malleable.

"The moment has arrived when we can think powerfully about digital invention," noted Morrell in his webinar remarks. In today's digital era, coding represents just another modality that can empower both teachers and students as they take the next steps along the literacy continuum. The RWC series made clear that teachers can and must use these "new" modalities to help mediate power dynamics and create more equity in our classrooms and, ultimately, in our society.

For the RWC webinars, NCTE partnered with United Way of New York City to present industry-leading academics who are helping English teachers to reimagine what equity, literacy, and technology mean in their classrooms. The goal of the project is for RWC Fellows (made up of New York City middle school and high school English teachers) to learn about and expand access to computer science in their classrooms for students who have historically been left out.

"This program is centered around disrupting education inequity by making computer science more accessible to students across New York City schools," said Grace Bonilla, President and CEO at United Way of New York City. "We are grateful to partner with NCTE to address the digital divide while empowering students with the necessary tools for successful civic and economic engagement."

Student response to the addition of computer science has been positive. NCTE Executive Director Emily Kirkpatrick reported that "The RWC Fellows repeatedly commented to me that they saw the highest student engagement of the year during lessons that incorporated computer science and ELA. This is a remarkable opportunity—for individuals and our entire discipline. NCTE's partnership with United Way of New York City makes the work many leaders loosely envision a true reality. I look forward to expanding this project in NYC and the general premise far beyond any geographic boundary."

For the webinar series, the conversations focused on how computer science concepts and methods can deepen and expand the teaching of English, increasing educational equity via literacy innovation.

Citing *The Innovator's Dilemma* (Christensen 1997), Morrell pointed out that "Disruptive technologies can be harnessed by young people to fundamentally remake and inhabit new worlds of their creation." Morrell was referring to such "disruptive" technologies as the Metaverse, augmented reality, virtual reality, e-sports, 3D printing, and artificial intelligence, all of which are dependent upon the language of coding. Morell urges us to "Think about what this language means for those who can speak this language . . . It's a language of power. It is a different kind of creativity, a multimodal creativity, moving from consumption to production."

Even though there are certainly current innovative developments related to the link between math, computer science, and literacy, as presenter Sarah Hart

> "We do this constantly in math. We create an imaginary world that tells us a truth about reality, but it isn't reality."
>
> —*Sarah Hart*

Sarah Hart

Matthew Jockers

pointed out, the link between mathematical themes and literature has always been with us. Hart, the author of *Once upon a Prime: The Wondrous Connections between Mathematics and Literature* (2023), reminded participants that the oldest poetry (that has a named author) is by a temple priestess in Egypt called Enheduanna who often included mathematical themes in her work. "She was a poet, but she was also doing mathematics and astronomy," Hart described. "Mathematicians and scientists love poetry and poets enjoy mathematics. You don't have to choose!"

Additionally, Hart drew attention to the many themes and principles that show up in the literary canon taught in English classrooms. Writers she focused on were Omar Khayyam, Herman Melville, and George Eliot (Mary Ann Evans). Additionally, Hart said, "There are certain numbers that crop up again and again. Goldilocks meets three bears; there are three witches in *Macbeth*; Snow White meets seven dwarves." Ishmael muses about the tautochrone problem and cycloids in *Moby-Dick*, and Michael Crichton features chaos theory and fractals in *Jurassic Park*. And Hart reminded participants of the blurred line between fiction and mathematics: "There is no such thing as a circle in the real world. You can't have these perfect Platonic ideas of shapes! However, we are making an imaginary model. It is fictional. But it tells us something powerful that is somehow more true than all the imperfections. We do this constantly in math. We create an imaginary world that tells us a truth about reality, but it isn't reality."

Presenter Matthew Jockers, a leading digital humanities researcher, also discussed the vintage nature of these links between math and literature, reflecting that the field of digital humanities began when a Catholic priest named Roberto Busa wanted to create a word index of St. Thomas Aquinas. Father Busa wanted to know, "How did St. Thomas use words?" Jockers himself has used computers to study different handwritten versions of Beowulf to explore how

CONTINUED ON P. 22

NCTE RWC Read & Write + Code

United Way of New York City

Presenters in the Read & Write + Code Fellowship webinar series challenged teachers to look at the natural interplay between computer science, coding, mathematics, and the literary arts. The sessions are available to view in NCTE's Video Library and at the links below.

- "What's Code Got to Do with It?" with Ernest Morrell: **bit.ly/rwc-1**
- "A Powerful Partnership: Technology and Language Instruction" with Antero Garcia and Chris Proctor: **bit.ly/rwc-2**
- "Once upon a Prime: The Connections between Mathematics and Literature" with Sarah Hart: **bit.ly/rwc-3**
- "Digging In to Digital Humanities" with Matthew Jockers: **bit.ly/rwc-4**

 continued from p. 21

> "There are tremendous opportunities to connect with practices like restorative justice in terms of reconciling or at least of being at peace with different interpretations."
>
> —*Chris Proctor*

Chris Procter

Antero Garcia

each scribe used words—noting that different scribes had different stylistic entailments. Looking at these entailments of specific writers, using computer analysis, helps make the invisible visible for both readers and writers. Jockers, coauthor of *The Bestseller Code* (2016), made the point that bestsellers tend to have commonalities and that identifying these commonalities can help students understand the patterns and devices that typically engage readers, strengthening their writing.

It's clear that whether or not we have caught up to these new literacies, our young people are already immersed in this digital communication. The webinar series considered how English teachers might enlist these new authentic modes of communication. Morrell suggested having students design video games with the popular computer programming tool Scratch, for example, to share some kind of overarching social message. Or perhaps to develop and pitch concepts for apps based on themes being studied in class. "Young people can learn how to code in basic ways," Morrell stated, "and it becomes just another way of expression. Young people write scripts. Video games often have narratives and characters that are scripted. These are just more toolkits that young people can use to share what they're learning about in their classrooms. The more that we find authentic ways for young people to manifest agency, these modes of literacy become more necessary to their ends and not ours."

In "A Powerful Partnership: Technology and Language Instruction," Antero Garcia and Chris Proctor discussed a free resource called Unfold Studio (https://unfold.studio/), which allows kids to write interactive stories. Think of the *Choose Your Own Adventure* books but online, as kids learn to code stories to include alternative plots. Proctor described, "I had this hunch that some of the structure of the digital world is where a lot of the meaning is getting made and that some of that medium needs to get into our authoring, too. Don't get me wrong—a creative writing class is awesome, but having some of the affordances of the digital world mixed in there is all the better." This kind of authoring, known as "interactive storytelling," allows students to "play from the outside" but also to "get inside." "You can see how it works," Proctor explained.

Incorporating coding as a part of the writing process allows students to practice writing for the nonlinear ways we read online. Proctor described, "This is going back to Grammar B in nonlinear composition—the idea that there are knots that are connected in nonlinear ways. The moves you can make as an author are enlarged, not only writing what's happening in the story, but you're also scripting the player's or the reader's possibilities, allowing for some really neat possibilities from a reader response perspective. You can, for example, have someone become a witness in the story, or you can have someone become implicated in the story."

This enhanced agency brings with it a host of social-reality implications. "Kids can write stories in which they are retelling painful things or interesting things that have happened in their own realities," Proctor noted. "You can write the story to include many different points of view. You don't actually need to have it resolved. Everyone doesn't have to agree at the end on what was the right thing or even what happened. There are tremendous opportunities to connect with practices like restorative justice in terms of reconciling or at least of being at peace with different interpretations."

Proctor demonstrated how using a system such as Unfold Studio can also help with nonfiction argumentative writing. "It's very straightforward to put a text into Unfold Studio as an analytic tool for how (the) text is making meaning. We've used

Gerald Graff's tool *They Say/I Say* (2024), for example for helping students think about arguments and the transitions between them. You can even take an argument and weave in rebuttals and develop a nonlinear argument."

Proctor and Garcia emphasized the playful side of linking coding with more traditional forms of English teaching. "Instead of having a worksheet with 18 syntax things you have to learn," Proctor mentioned, "we would look at an interactive story. . . . We sort of figure it out by playing it. You're programming without programming. You don't have to think about the code. But pretty quickly, you want to add a fourth perspective. Or you want to add another part to the story. You're learning the code in the same way you learn literary elements in a writer's workshop or stylistic strategies. You're learning a new tool for meaning-making rather than just some sort of arbitrary content to be learned." Garcia noted the playful elements involved: "The most guiding feature for teachers is to think of a narrative component around games. Even if you are playing a game like tic-tac-toe, you can say, 'I tricked my opponent.' Every game is a learning game. Games are always learning, even ambient, passive games. How might we be playful in the world around us?"

To sum up their session, Proctor asked these questions: "As a teacher, how do I engage with the digital world, the realities that my students live with, the texts they live with? Where is meaning-making happening now in really urgent ways? It's happening in social media; it's happening in SMS chats; it's happening on TikTok. All of the things that new literacies have focused on over the years—how do we focus on what's happening in a TikTok while also thinking about what TikTok is and the context of how TikTok came to us? It's so rich for ELA pedagogy!"

All of the conversations that took place as part of this webinar series pointed out the natural synergies between math, computer science, and English language arts. Proctor highlighted, "This is where I see the work of computer science teachers and ELA teachers as fundamentally the same. In ELA, we are aware in ELA of the importance of craft, of the importance of infrastructural

Computer science concepts and methods can deepen and expand the teaching of English, increasing educational equity via literacy innovation.

technologies. The questions are the same. They haven't changed. The thinking we've done in ELA is the right thinking. These questions of meaning-making, of power through language are as old as language." Indeed, Proctor pointed out how much this work draws upon previous work done in the areas of new literacy studies, culturally responsive teaching, student agency, and socio-cultural literacy research.

Challenging the participants, Morrell asked, "How do we bring interests and expertise of contemporary students [into our classrooms]? We have to make those connections. We must have access. We must have time to explore, to play, to fail. We must provide access to joy, purpose, and agency. We need to get ready as a profession to take this on. It is necessary. And it is just."

REFERENCES

Archer, Jodie, and Matthew L. Jockers. 2016. *The Bestseller Code: Anatomy of the Bestselling Novel*. New York: St. Martins Press.

Christensen, Clayton M. 1997. *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*. Boston: Harvard Business Review Press.

Eisenstein, Elizabeth L. 1980. *The Printing Press as an Agent of Change*. Cambridge: Cambridge University Press.

Graff, Gerald, and Cathy Birkenstein. 2024. *They Say/I Say*, Sixth edition. New York: W. W. Norton and Company.

Hart, Sarah. 2023. *Once upon a Prime: The Wondrous Connections between Mathematics and Literature*. New York: Flatiron Books.

WILLIAM KIST IS THE AUTHOR OF *CURATING A LITERACY LIFE* AND THE COEDITOR OF NCTE'S *SPECIAL ISSUES, VOLUME TWO: BRINGING CRITICAL MEDIA LITERACY INTO ELA CLASSROOMS*—WINNER OF THE DIVERGENT PUBLICATION AWARD FOR EXCELLENCE IN LITERACY IN A DIGITAL AGE RESEARCH.