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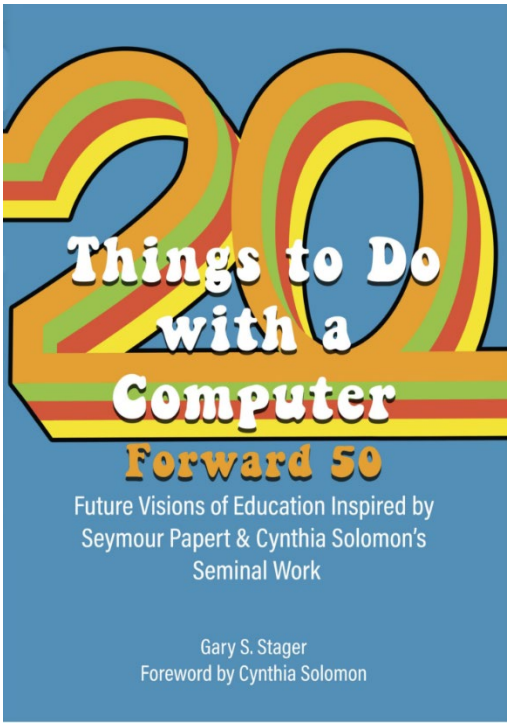
Reflection: Twenty Things to Do With a Computer – Fifty Years Later

Gary Stager
CMK Futures

Editor's Note. The paper "Twenty Things to Do With a Computer," written by Seymour Papert and Cynthia Solomon in 1971, is republished in this issue of the CITE Journal to celebrate its fiftieth anniversary. A book edited by Gary Stager, a Computer Forward 50, includes perspectives from many of the educational computing pioneers who were influenced by this work. The following commentary provides background and an overview of the material found in this book.

The unwieldy title of our new book reveals the magnitude of its ambition. *a Computer Forward 50: Future Visions of Education Inspired by Seymour Papert and Cynthia Solomon's Seminal Work* is a celebration of the vision set forth by Papert and Solomon a half century ago. An eclectic collection of experts invites us to consider the original provocations, reflect on their implementation, and chart a course for the future of learning through personal recollections, learning stories, and imaginative scenarios.

"Twenty Things to Do With a Computer," written by Seymour Papert and Cynthia Solomon, set the course of education for the next 50 years and beyond. The paper anticipated one-to-one personal computing, the maker movement, the rise of computational thinking, children programming computers, robotic construction kits, computer science for all, and integration of computing across the curriculum. All of this occurred decades before such notions became commonplace. Even more remarkably, Solomon and Papert demonstrated what these ideas looked like in practice.



Papert and Solomon demonstrated how computing could be creative, humane, whimsical, childlike, and a way to learn "everything else," even ideas at the frontiers of mathematics and science. *Twenty Things to Do With a Computer Forward 50* is an effort to share timeless, powerful ideas with future generations seeking a more creative, personal, empowering, and meaningful educational experience for young people.

My four decades of work in schools around the world is built upon what I learned working with my friends Cynthia Solomon and Seymour Papert. This book represents one of my efforts to honor and preserve their work. (I also curate an archive of Papert's work at dailypapert.com.) The 50th anniversary of "Twenty Things to Do With a Computer" presented an irresistible opportunity for me to invite friends, colleagues, and people I respect to think about where we have been and where we might go.

Essays were contributed by folks inventing the future in the 1970s, including Cynthia Solomon herself, Ken Kahn, Dan Watt, José Valente; folks who brought Logo into the educational mainstream in the 1980s like Tom Lough, Molly Watt, Karen Billings, Marian Rosen Eleonora Badilla Saxe, and David Thornburg; former students of Papert, including Yasmin Kafai, David Cavallo, Fred Martin, Paulo Blickstein; folks creating the next generation of constructionist learning materials like Conrad Wolfram and Tom Lauewers; provocateurs like TED Prize winner Sugata Mitra, writer Audrey Watters and *Make Magazine* founder Dale Dougherty; the first school leaders to embrace one-to-one computing decades ago; and terrific educators who inspire me every day. Nothing brings me greater joy than to share my smart witty friends with other educators. This book presented

an opportunity for me to celebrate their work and powerful ideas while allowing me to make new friends, too.

The book is organized into four sections representing particularly provocative aspects of the original "Twenty Things" paper. More than four dozen scholars, teachers, school leaders, tech pioneers, provocateurs, and academics from nine countries contributed to the book. They review the past 50 years of educational computing, Papert and Solomon's contributions, the rise of personal computing, school's resistance to change, and aspirational visions for the next half century.

While the book is about computing, teaching, learning, and mathematical thinking, my not-so-tacit objective was to situate the powerful ideas of Solomon and Papert in a continuum of progressive education. What they did a half century ago not only contributed mightily to the creation of the field of educational technology and laid the foundation for the maker movement, but it also represents a coherent vision for progressive education in the 21st century. Papert and Solomon are the bridge between Dewey and Stephen Wolfram – the Reggio Emilia approach and synthetic biology – mudpies and computational thinking – Computer Science for All and Piaget.

I often ponder the wisdom of the great jazz musician Jimmy Heath who taught me, "What was good, is good." There is nothing outdated or nostalgic about Papert and Solomon's work of a half-century ago, or since. I still teach the Logo programming language they developed to children and teachers around the world and am continuously reminded of its power as an intellectual laboratory and vehicle for self-expression. Children born into a world of AI, VR, AR, and countless other high-tech acronyms find communicating with the turtle as compelling today as ever before. On countless occasions, students understand mathematical concepts that may elude them, despite years of carefully planned curriculum. They solve problems that impress their teachers, not just by their ingenuity, but because the adults in their lives could never have even anticipated such scenarios.

Perhaps most importantly, I use children's project work in Logo as a way of making thinking visible to teachers who may otherwise be unacquainted with the intellectual competence and creativity of their students. Teachers carefully observing children's thinking while engaged in Logo programming experience the value of projects, habits of mind, flexibility, agency, the centrality of the learner, and the need to reclaim the time necessary for fluency development. The gifts Papert and Solomon gave us represent an on-ramp to a world of educational wisdom that might otherwise be forgotten.

Papert and Solomon taught us that the true power of computing isn't teaching the same content with greater efficiency or comprehension, but rather the affordances it provides to create experiences in which students learn and do in ways unimaginable just a few years ago. Fifty years after publication of the original paper, low-cost technology, including micro:bits, laptops, block programming environments, 3D printers, laser cutters, soft circuitry, sensors, and the Web, democratize access to the experiences proposed in "Twenty Things." Such experiences are wholly

consistent with the best traditions of learner-centered education and child development. We are adding wicked cool cybernetic colors to the crayon box.

Teaching every child to program computers, computers they own and perhaps even build and maintain, is a way of gaining agency over an increasingly complex and technologically sophisticated world. Papert and Solomon told us in 1971 that "if every child were to be given access to a computer, computers would be cheap enough so every child could be given a computer." Solomon and Papert had demonstrated this in classrooms with real children by the time "Twenty Things" was published. The great audacity of Solomon, Papert, and their disciples was a conviction that teachers are competent and capable of producing productive contexts for learning.

Our book illuminates a world of powerful ideas by standing on the shoulders of giants and celebrating a 29-page paper. The work of Papert and Solomon is like a fractal. At every level of magnification, you get a glimpse of all we can be *and* how we might realize the possibilities afforded to us by modernity. In *Twenty Things to Do With a Computer Forward 50*, a diverse collection of practitioners and scholars help us invent the future we desire for the children we love. Nothing would please me more than if teachers of today *and* tomorrow were inspired to teach in a fashion rooted in a confidence that things need not be as they seem. I hope our book helps illuminate many paths for learners of all ages.