

## The Seeds That Seymour Sowed

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In writing about Seymour Papert, I want to look forward, not backwards. How can we make sure that Seymour's ideas live on, even though he's no longer with us? What can we do to support the spread of Seymour's ideas, so that they continue to inspire and influence people around the world – children and parents and teachers and researchers?

I initially thought about framing this essay around the phrase *Putting Papert into Practice*. (I've always had a weakness for alliteration.) But as I thought about this phrase, it didn't feel right. Seymour wouldn't have liked it. It's too simplistic to think that you can just take someone's ideas and put them into practice. Seymour was always skeptical about that type of top-down, linear thinking.

Seymour had a more organic view of teaching and learning – and a more organic view of how ideas spread. The process is not like an engineer building a structure according to specifications. It's more like a farmer or gardener tending to plants, creating an environment in which the plants will flourish.

As I thought about this, a new phrase, still alliterative, came to mind: *The Seeds that Seymour Sowed*. That feels better, more in Seymour's spirit. Seymour was constantly planting new seeds, new ideas. Some were mathematical ideas, some were pedagogical ideas, some were technological ideas, some were epistemological ideas. Some of Seymour's ideas spread like wildflower around the world. Some of his seeds took root in a few places, but not in others. Some of his seeds still lie dormant in the ground, waiting for others to provide the proper nurturing, the right conditions for growth.

Let me share a story about some of the seeds that Seymour sowed and how they began to take root. The story involves a 10-year-old boy named Nicky, who was participating in a summer workshop here at MIT back in 1985. It was one of the first workshops in which kids were creating projects with LEGO/Logo, using Seymour's Logo programming language to control their LEGO constructions.

Nicky started his project by building a car out of LEGO bricks. After racing the car down a ramp several times, Nicky added a motor to the car and connected it to the computer. When he programmed the motor to turn on, the car moved forward a bit -- but then the motor fell off the body of the car and began vibrating across the table.

Rather than trying to repair the car, Nicky became intrigued with the vibration of the motor. He played and experimented with the vibrating motor, and began to

wonder whether he might be able to use the vibrations to power a vehicle. Nicky mounted the motor on a platform atop four "legs" (LEGO axles). After some experimentation, Nicky realized that he needed some way to amplify the motor vibrations. To do that, he drew upon some personal experiences. Nicky enjoyed riding a skateboard, and he remembered that swinging his arms gave him an extra "push" on the skateboard. He figured that a swinging arm might accentuate the vibrations of the motor as well. So Nicky connected two LEGO axles with a hinged joint to create an "arm," and attached the arm to the motor. As the motor turned, the arm whipped around -- and amplified the motor vibrations, just as Nicky had hoped. Nicky was pleased with his machine, which vibrated its way across the table.

Over time, Nicky was even able to steer his machine. When he programmed the motor to turn in one direction, the machine vibrated forward and to the right. When he programmed the motor to turn in the other direction, the machine vibrated forward and to the left. At one point, he even added a light sensor, and tried to program the machine to follow a flashlight.

In this story, we can see examples of the seeds that Seymour sowed. An important element of the story is that Nicky was given time and encouragement to follow his interests and curiosity. He wasn't given a specific goal or specific task, as in many classroom activities. Seymour recognized the importance of kids not just answering questions but finding their own questions, developing their own projects. That was one of the seeds that Seymour sowed.

When the motor on Nicky's car fell off and vibrated across the table, Seymour and others at the workshop encouraged Nicky not to see it as a failure, but as an opportunity for new explorations. Seymour recognized the importance of kids trying new things, taking risks, experimenting, and taking advantage of the unexpected. That was one of the seeds that Seymour sowed.

When Nicky needed to amplify the vibrations of the motor, he drew on his personal experiences as a skateboarder, similar to the way that kids programming the Logo turtle use their own body knowledge to think through the movements of the turtle. Seymour called this body-syntonic learning. That was one of the seeds that Seymour sowed.

And in programming his walker to follow a flashlight, Nicky was exploring ideas of feedback, sensing, and control – ideas that were previously inaccessible to elementary-school students. Seymour saw these ideas as powerful ideas. These too were seeds that Seymour sowed.

Looking at Nicky through a 2017 lens, we would call him a *maker* and a *coder*, engaging in *computational thinking*. Of course, few people were talking about making and coding and computational thinking in 1985. And no one was talking about a maker movement or a coding movement. But Seymour was laying the

intellectual foundations for those movements – or, should I say, sowing the seeds for those movements. As I see it, Seymour should be viewed as the intellectual godfather, or the patron saint, of the making and coding movements. He sowed the seeds for these current-day movements.

Many of Seymour's seeds are bearing fruit. Today, more children in more places have more opportunities for exploring, experimenting, and expressing themselves with new technologies than ever before, and many of these opportunities can be traced back to the seeds that Seymour sowed.

That doesn't mean that Seymour would embrace everything that's happening today under the banners of making and coding and computational thinking – just as he didn't embrace everything that happened under the banner of Logo in the 1980s and 1990s. Seymour was frustrated when schools simply taught children to draw squares and triangles, and stopped there, never truly engaging with the powerful ideas of programming. As Logo spread around the world, he worried that the core ideas were becoming diluted; he even coined the term "epistemological dilution" to describe the process. In the year 2000, twenty years after the publication of his book *Mindstorms*, he complained that too many people focused on just the first two items in the subtitle (*Children and Computers*) and forgot about the third (*Powerful Ideas*).

I'm sure that Seymour would have similar concerns about many of the activities around making and coding and computational thinking today. And I'd agree with him. Even as new technologies proliferate, and more children are making and coding, Seymour's powerful ideas are often missing. Many of Seymour's seeds are still dormant in the ground, or not sprouting as strongly as they might, or sometimes stomped on as they begin to grow.

As I see it, the problem is not in the seeds, but in creating the right conditions for them to grow. To be honest, Seymour was probably better at sowing seeds than nurturing them. It's not easy to create the right conditions to support the growth of Seymour's seeds. Many of us are still trying to figure out the best way to do it.

Here at the Media Lab, as we work to support and extend Seymour's ideas, we sometimes organize our thinking around four core ideas, captured in four words: Projects. Passion. Peers. Play. (Yes, more alliteration.) We constantly ask: How can we provide opportunities for people to engage in *projects*, based on their *passions*, in collaboration with *peers*, in a *playful* spirit?

Let me say a bit about each of these 4 P's, and how they connect with Seymour's ideas about learning.

**Projects.** Many math and science educators place a special focus on problem-solving. Seymour took a provocatively different approach, arguing for "projects over problems." Of course, Seymour wasn't opposed to problem solving, but he

felt that it was important for children to engage with problems in the context of meaningful projects. His goal was for children not just to *understand* new ideas, but to *use* new ideas, to express themselves with new ideas, to become fluent with new ideas. And he saw projects as the best way to do that.

**Passion.** In the Foreword in *Mindstorms*, Seymour describes how his childhood fascination with gears provided him a way to explore important mathematical concepts. For me, the most important and memorable line in the Foreword is when Seymour wrote: “*I fell in love with the gears.*” Seymour understood the importance of learners building on their interests and passions. He knew that people will work longer and harder, and make deeper connections to ideas, when they’re working on projects that they’re passionate about. Seymour once said: “Education has very little to do with explanation, it has to do with engagement, with falling in love with the material.”

**Peers.** Towards the end of *Mindstorms*, in the chapter titled “Images of the Learning Society,” Seymour wrote about the Brazilian samba schools, where people come together to create music and dance routines for the annual carnival festival. What intrigued Seymour most was the way that samba schools bring together people of all different ages and all different levels of experience. Children and adults, novices and experts, all working together, learning with and from one another. For Seymour, this type of peer-based learning was at the core of a Learning Society. The technologies of the 1960s and 70s and 80s weren’t quite ready for the type of peer-based online collaboration that we see today, but Seymour saw the potential and possibilities for the power of peers.

**Play.** I sometimes call this the most misunderstood of the four P’s. Often, people associate Play with laughter and fun. But for Seymour, play involved experimenting, taking risks, testing the boundaries, and iteratively adapting when things go wrong. Seymour sometimes referred to this process as “hard fun.” And Seymour didn’t just encourage play and hard fun for others; he lived it himself. He was always playing with ideas, wrestling with ideas, experimenting with ideas. I never met anyone who was, at once, so playful and so serious about ideas.

Projects, Passion, Peers, Play. For me, these four P’s represent four of the most important seeds that Seymour sowed. In my research group, as we develop new technologies and activities, we’re always thinking about these four P’s, to make sure we stay aligned with Seymour’s ideas. I think the success of our Scratch software is due largely to its grounding in Seymour’s ideas about Projects, Passion, Peers, and Play.

- Unlike many of today’s coding initiatives, where children are presented puzzles to solve, Scratch encourages children to create their own *projects*, rather than solving someone else’s puzzles.

- Scratch supports a wide variety of different types of projects, from animated stories to interactive art to science simulations, since we want make sure that children have a chance to work on projects they care about, projects that connect with their *passions*.
- The Scratch programming language is seamlessly integrated with an online community, where children can collaborate, remix, and comment on one another's projects, so that children learn with and from their *peers*, similar to the samba schools that fascinated Seymour.
- We designed Scratch to encourage experimentation and tinkering, so that children can *play* with programming blocks the same way the play with LEGO bricks.

A few years ago, I made a presentation about Scratch at educational technology conference. After my presentation, in the Q&A session, someone stood up and asked, rather aggressively: "Wasn't Seymour Papert trying to do the same things 20 years ago?" The comment was meant as a critique; I took it as a compliment. I answered simply: "Yes." Indeed, almost all of my work is directly inspired by Seymour's ideas, and I have no shame, only pride, about that.

I fell in love with Seymour's ideas more than 30 years ago, and I never fell out of love with Seymour's ideas. I continue to feel that Seymour's ideas provide a vision for the type of society that I want to live in. I will be happy to spend the rest of my life working to nurture the seeds that Seymour sowed – and I hope others will too.