

FACE to FACE: Alan Kay Still waiting for the Revoultion

Interview by Lars Kongslem

Since inventing much of the technology behind personal computing in the late 1960s, Alan Kay has dedicated his work to developing better learning environments for children. Now a senior researcher at HP and the president of Viewpoints Research Institute, Kay is launching Squeak, a multimedia authoring tool that allows children to construct dynamic simulations of real—world phenomena. We spoke with him about the unfulfilled promise of technology in schools—and about what computers have in common with pianos.



Q: You often say that the computer revolution hasn't happened yet. What do you mean by that?

A: If you look with a squinty eye at most of personal computing today, you'll see we're basically just automating paper—using digital versions of documents and mail. But as was the case with the invention of the printing press, the interesting thing about the computer is that it allows you to have new ways of representing things, new ways to argue about things, and new kinds of fluencies.

Most schools define computer literacy as being able to operate Microsoft Office and maybe do a little web design. They're missing the point. That's like saying, "If you know which end of a book to hold up, and you know how to turn to Chapter Three, then you're literate."

Literature is first and foremost about having *ideas* important enough to discuss and write down in some form. So you have to ask, "What is the literature that is best written down on a computer?" One answer is to make a dynamic simulation of some idea that you think is important, a simulation that you can play with and that you can learn from.

Q: What kinds of new ideas and arguments do computer simulations make possible?

A: Well, for children, a really interesting argument that might be nice for everyone in the world to learn is that a disease that is contagious, deadly, and incurable will have an exponential growth curve. And that is an almost impossible argument to make—especially to children but also to most adults—if you just show them a mathematical formula with an exponential in it. Because it's beyond our unaided imaginations to think in a nonlinear fashion.

But part of the process of becoming a scientist or a mathematician is to learn how to think nonlinearly a little bit. So a child using Squeak or Logo software can create a bunch of little sprites on the screen and write a small program that bounces them off each other, so that they basically have a simple infection system. If you spread out a few hundred of these and give them a wide area, you'll get the curve that an AIDS epidemic generates—which has almost nothing happening in the front part of the curve, because the probability of infection is very low. But as soon as you get enough of the sprites infected, which takes a while, the infection rate shoots through the roof and soon the sprites are all dead.

So by first writing that simulation yourself, you know what the assumptions are. And by letting it run through, you can generate the phenomena and get a visceral sense of it, and then you can capture what happens in a graph. This way, the computer can be a kind of thought amplifier.

Q: U.S. schools have spent \$40 billion on computers and Internet access. Do you think they've put that technology to good use?

A: It's a chicken and the egg thing. What's happened is probably a successful egg—but with no chicken yet in sight. I can go into virtually any school that has computers and see children who are happily using them, as well as see teachers who are happy that the kids are using them. Parents are happy, principals are happy, and school boards are happy. But if you know anything about computing or about math and science, you can see that very little of importance is going on there.

One of the things that pollutes a lot of computer use in schools is a heightened sense of vocationalism. Parents are concerned about whether their children are going to get jobs, and so they really want the schools to train the kids. But my belief is that the training part is kind of like driver's ed: It takes about as long to learn how to use a computer as it takes to learn how to drive a car, maybe less. So it's not something you really want to pin twelve years of school on.

That's one of the reasons why, in my research, I've retreated into early childhood. The earlier you go, the further away you are from the thing that parents are worried about—which is whether the kids are going to get jobs. However, vocationalism is now rampant in elementary schools, even in kindergarten.

Q: What have you found to be the greatest obstacle in your work?

A: I think the most difficult part is helping the helpers. Logo was a great idea and it failed. It didn't fail because computers couldn't do Logo, and it didn't fail because Logo software was bad. It failed because the second and third waves of teachers were not interested in it as a new thing, and virtually none of them understood anything about mathematics or science. It's very hard to teach Logo well if you don't know math. But one of our ways around it this time is that the Internet is getting mature enough to do some of the online mentoring ideas we'd had a long time ago. Our idea is to extend the one-room schoolhouse to the entire world.

Q: What do you think of the current trend toward one-to-one computing in schools, in which every kid has his or her own laptop or handheld?

A: Well, that's why I invented the idea of the Dynabook [Kay's 1968 prototype for a wirelessly networked, multimedia laptop]. That's the whole point of that concept. As Seymour Papert once pointed out, just imagine the absurdity of a school that has only two pencils in each classroom. Or imagine a school where all the pencils are locked up in a special room.

But I think the big problem is that schools have very few ideas about what to do with the computers once the kids have them. It's basically just tokenism, and schools just won't face up to what the actual problems of education are, whether you have technology or not.

Think about it: How many books do schools have—and how well are children doing at reading? How many pencils do schools have—and how well are kids doing at math? It's like missing the difference between music and instruments. You can put a piano in every classroom, but that won't give you a developed music culture, because the music culture is embodied in *people*.

On the other hand, if you have a musician who is a teacher, then you don't need musical instruments, because the kids can sing and dance. But if you don't have a teacher who is a carrier of music, then all efforts to do music in the classroom will fail—because existing teachers who are not musicians will decide to teach the C Major scale and see what the bell curve is on that.

The important thing here is that the music is not *in the piano*. And knowledge and edification is not *in the*

computer. The computer is simply an instrument whose music is ideas.

Educators have to face up to what 21st-century education needs to be about, and start thinking about solving that problem long before they bring the computer on the scene.

Q: Well, what should 21st-century education be about?

A: The most critical thing about the 20th and 21st centuries is that there's a bunch of new invented ideas—many of them connected with modern civilization—that our nervous systems are not at all set up to automatically understand. Equal rights, for example. Or calculus. You won't find these ideas in ancient or traditional societies.

If you take all the anthropological universals and lay them out, those are the things that you can expect children to learn from their environment—and they do. But the point of school is to teach all those things that are *inventions* and that are hard to learn because we're not explicitly wired for them. Like reading and writing.

Virtually all learning difficulties that children face are caused by adults' inability to set up reasonable environments for them. The biggest barrier to improving education for children, with or without computers, is the completely impoverished imaginations of most adults.

Q: Why hasn't educational computing lived up to the potential that you and Papert saw in the 1960s?

A: Don't even worry about computers yet. When did math and science actually start becoming important for everyone in our society to know? Probably 200 years ago. Now think about how poorly math and science are being taught in elementary school today. So don't even worry about computers; instead, worry about how long it takes for something that is known to be incredibly important to get into the elementary-school curriculum. That's the answer. Of course it's taking forever—because the adults are the intermediaries, and *they* don't like math and science.

So computers are actually irrelevant at this level of discussion—they are just musical instruments. The real question is this: What is the prospect of turning every elementary school teacher in America into a musician? That's what we're talking about here. Afterward we can worry about the instruments.

For more information about Squeak, go to www.squeakland.org.

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