Texas Education Review

A Brief History of (Edtech) Time

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Volume 1, pp. 104-118 (2013)
Available online at www.txedrev.org

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This year, 2013, marked a turning point – the time when people stopped asking whether technology had a role in schools and instead asked what technology should be used. It is a significant milestone in the tortuous relationship between learning and technology but hardly the end of the story.

Over the past century, our lives have changed, in some cases quite radically, as the tools that we use to live, work, play, and learn have changed. All of this technology emerges from a cauldron of social and political forces.

This essay aims to explore the evolution of the potent brew of technological, economic, and social elements that began to catalyze around 2010 and resulted in an explosion of education technology. This technology has the potential to change how and where we (and our children) will learn in the years to come, yet the success or failure of the technology will ultimately depend on the social forces around it.

Computers Gate Crash Popular Culture

Because just about all core technologies used in schools were developed and tested in other fields, it is instructive to peek briefly at the history of information technology itself.

Kings and other people of influence wielded power in part by owning information and its sources. Likewise, the history of computing is essentially a long saga about who controls information. Gradually computational engines helped loosen the grip of the privileged on information, starting with commercial

computers such as the UNIVAC (in the 1950s) that sorted through United States census data.

By the 1960s, huge mainframe computers filled rooms with switches and reels of magnetic tape, literally tended by data specialists in white coats. The machinery, and the information it produced, was still largely the property of governments and large corporations, and its use required specialized knowledge.

This made the evolution of personal computers, stunningly characterized by Apple Computer and its iconic 1984 Super Bowl ad, a radical shift: control of the means of manipulating information was becoming more democratic, more popular. Anyone could imagine using the technology. The tiny teams of elite, data scientists in white coats expanded dramatically to include tee-shirt wearing hackers.

Anyone did not quite mean everyone, however. In spite of glamorous commercials, figuring out how to use computer technology was still a challenge. Early personal computer programmers had to master arcane languages such as assembly language and Fortran. Anyone who wanted to pour time and energy into learning to wield the tools could. But the chasm between what the technology could do for the knowledgeable and what many people experienced was still huge.

Enthusiasm buoyed the movement forward, and in some cases, quite purposefully so. Beginning in the 1960s, Professor Seymour Papert studied how computers could support student learning and developed the Logo programming language for children. In a 1970 interview with *Computer Decisions*, Papert said:

> With computers, there is a substantially bigger chance that you can lead the child with less effort into something he really likes doing . . . The intersection with the set of fun things with the set of educational things is sufficiently big

> so that you should be able to keep every student internally motivated. (Boss, 2011)

In the 1980s, Apple cofounder, Steve Jobs, launched a campaign to make Apple II computers widely available in schools by creating a low-cost program that encouraged schools to buy computers. "It [Apple II] was aggressively marketed through volume discounts and manufacturing arrangements to educational institutions which made it the first computer in widespread use in American secondary schools." (Weyeich, n.d.)

And so, U.S. schools snapped up computers, proudly installing them in the corners of classrooms and eventually in specialized computer labs. In some cases, magic happened: high-energy teachers devoted hours to learning to use the machines. Curious students poked and prodded. A cadre of educators, energized about the potential of computers in schools, started companies to build applications.

It was hard work. Starting a company in the late 1980s was expensive. Capital for starting companies was scarce and costly. The technology, starting with the computer hardware and operating system software platforms, was still immature and limited in what it could do. Sales staff typically sold "dreams," what the technology could potentially do, rather than what it could actually do. The very hard work of making the technology grow up, of transforming it from the aspirational realm into real practice, typically fell on the backs of the customers.

None of those challenges were unique to education. In the corporate world, ambivalence about the value of using computers was widespread. In the late 1980s and early 1990s, Morgan Stanley economist Stephen Roach wrote numerous papers contending there was no empirical evidence of productivity gains from the use of computers (David, 1990; Gibbs, 1997). In 1996, MIT professor, Thomas K. Landauer published a thoughtful book,

The Trouble with Computers: Usefulness, Usability and Productivity. In it, he wrote:

> For over five years a debate has been in progress about how much – or even whether – computers contribute to improved productivity…The bottom line, it has been variously asserted, is that while there are exceptions, most business investments in computers have yield significantly lower returns than investments in bonds at market interest rates… (Landauer, 1996)

And yet in commercial sectors of the economy, a few of the potential customers of the fledging info-tech companies could see a glimmer of gold if they became expert at using computer technologies. Financial institutions could envision how speeding up the flow of information could help them make money faster. Manufacturers could see how they could save money or build better products with computer tools. Accountants, business managers and sales teams could imagine how more accurate and more timely bookkeeping could help them do their jobs better. The rewards for unlocking how to use the technologies were tangible. It was, as a result, worth their time to become experts in using the technology – in fact, to understand the technology so intimately that they could recommend how to improve it.

Not so in education. For starters, the goals of education have always been more diverse and harder to quantify. What's more, schools are typically pretty lean organizations: the majority of the staff is teachers, who are fully occupied in the day-to-day activities of teaching students. Unlike companies, there is little slack time to explore something with uncertain outcomes. Schools lacked control over most of their time and typically had only meager budgets to support exploration. Finally the penalties for failure were (and still are) huge. Teachers get one chance – at best, one year – with most students. If they fail to teach them the

expected grade-level skills and knowledge, students potentially face a huge uphill battle in the years to follow.

Such conditions meant that the teachers who pioneered innovative uses of computers in their classrooms in the late 1980s and early 1990s were truly exceptions. They poured extraordinary effort into their work, and frequently burned out. Although many became local heroes, few could create systemic change. When they inevitably left their schools their programs withered.

Educators were also confronting a deeper set of challenges: in April 1983, the National Commission on Excellence in Education (NCEE) issued a report*, A Nation At Risk: The Imperative for Educational Reform* (National Commission on Excellence in Education [NCEE], 1983). The report argued that the U.S. education system was falling behind the rest of the world. It was a harsh wake-up call much like Rachel Carson's Silent Spring on the environment.

By the 1990s, most schools, struggling with thinner budgets, wound up with few staff and little money to keep their computers current. Stories abounded of schools stuffed with piles of dusty, obsolete computers. One long-time education technology sales representative conceded to me that it pained her to think of the sales she made to districts; she knew the schools simply would not, or really could not, make use of the products she sold them.

The Early 1990s

Elsewhere, there was tremendous ferment in the computer technology sector during the early 1990s. The digital communications network which the Defense Department began funding in the late 1960s, the Arpanet, was moving into the public

realm. In 1990, the National Science Foundation assumed control of the network, now dubbed NSFNet and opened it up to non-defense related universities. In 1991, researchers at European Council for Nuclear Research in Switzerland pioneered the idea of the World Wide Web, as a means for more easily sharing information among physically separate computers. Students and researchers at the University of Illinois, Urbana Champaign rolled out a graphical interface, a web browser, in 1992.

The innovations in how to share and communicate information began gaining momentum. In 1995, Netscape Communications stunned the world by becoming a publically traded company before it was profitable (In fact, it had only a trickle of revenue.). Microsoft debuted a new operating system for personal computers (Windows 95) that was far more usable than any previous version. America Online was furiously lining the streets of America with CD-ROMs that helped people connect to online networks. Increasingly the bigger problem was figuring out how to find relevant information in the teeming online ecosystem. To address that issue, in 1997, two Stanford graduates founded a "search engine" company called Google.

By 1999, the commercial world of computing and data communication was exploding. In a giddy moment, investors funded everything that had an online presence: from auction houses and book stores to pet food companies. Education technology got swept up in this exuberance as well. In *The Fall of the Wall*, education technology specialist, Global Silicon Valley Advisors (GSVA), notes: "[Education technology] Deal activity rose from 11 transactions in 1998 to 106 in 1999 with a commensurate rise in dollar flows – $145 million in 1998 to $1.3 billion in 1999 – both staggering increases" (Global Silicon Valley Advisors [GSVA], n.d.). Everything from Kindergarten to corporate education won funding.

The crash of January 2001 decimated hundreds of Internet businesses – including education technology. Again, from the *Fall of the Wall*:

> A number of venture backed companies saw strong initial public market returns for their VC investors that evaporated relatively rapidly as the internet bust drove market levels down and/or financial performance disappointed. Examples included:
>
> - Digital Think
> - Lightspan
> - SABA
> - Scientific Learning
>
> Investment in edtech dried up for close to a decade. (GSVA, n.d.)

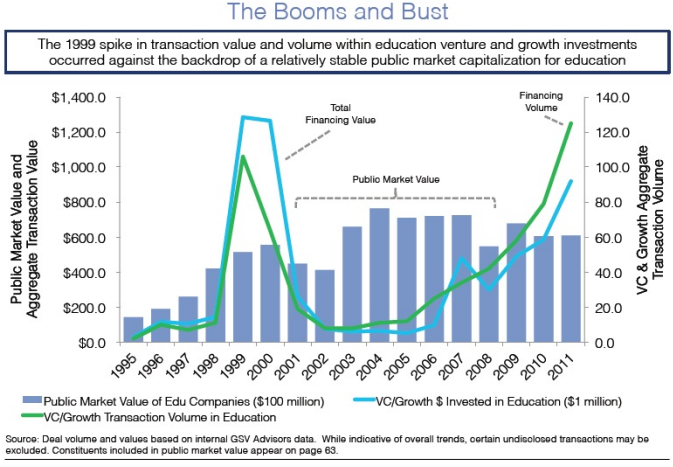

Figure 1. The Booms and Bust. Deal volume and values based on internal GSVA data (GSVA, n.d.). While indicative of overall trends, certain undisclosed transactions may be excluded.

Meanwhile, Back in the Classroom

Concern about education, meanwhile, was mounting. In 1990, Wendy Kopp started Teach For America, a program that took the "best and the brightest" recent college graduates and made them insta-teachers in some of the toughest schools in America. The program had mixed results for students; it did nonetheless focus the attention of many high-achieving young people on education.

Charter schools, public schools that operated outside of the usual union rules, began opening in the early 1990s. Charter school operators hoped to give low-income parents more choices about where to educate their students. The Knowledge is Power Program (KIPP) got started in 1994.

In 2001, the administration of George Bush passed No Child Left Behind, legislation aimed at prodding schools with high failure rates to improve their outcomes at the risk of losing funding. The law laid out requirements: schools had to demonstrate that they were making steady progress on standardized tests in order to receive funding.

The mortgage and financial sector meltdown of 2007 threatened every part of the economy. When President Barack Obama took office in 2009, he threw the government into managing a welter of big issues starting with the banking industry and health care.

Education was high on his list, too. Under Department of Education Secretary Arne Duncan, the Obama Administration established a multi-billion fund called Race to the Top that would be handed out to states and districts around the country that outlined plans for improvement.

In addition, also in 2009, a group of consultants to the state governors began drawing up the first set of national

curriculum standards that the U.S. would have, the Common Core Standards. They started with standards for math and English language arts. States began adopting the standards in 2010; standardized tests for evaluating how well students mastered the standards would not be fully available until 2014. But the emergence of those standards would begin to move the U.S. from a collection of close to 50 different requirements, each devised by an individual state, into a common "floor" standard, a change that made it possible for companies to start to see U.S. education as a more coherent market.

And by 2010 . . .

By 2010, the technology world looked markedly different than it had just 20 years earlier.

Computer technology had become widespread in virtually every business. Even better: the technology had improved. Microprocessors had become significantly more powerful; software was more usable. In many ways, information technology was finally delivering on its long-ago promises.

Communications technology, starting with mobile phones and increasingly moving into smart phones, was fast becoming ubiquitous among consumers in the U.S. and other developed countries. People in developing nations were not far behind.

The cost of starting a company had plummeted. Many of the people, including technologists, who had been out of work during the recession turned their efforts into developing software that would help them start businesses. Many adopted the freemium model, meaning that they initially made their software tools available for free, and as customers became more sophisticated and more devoted to using the tools, the software makers began to charge for usage. The result was a virtuous

cycle: free tools meant that other small businesses could get started for virtually no money down. As those fledgling businesses started to find paying customers, they, in turn, paid up for more sophisticated versions of tools that helped get them started.

And thanks to the astonishing success of the Internet generation of technology companies, a group of people in their thirties, many who were becoming parents, were wealthy enough to become angel investors. Many became fascinated by how the technology that had made such a huge difference in their lives could be better used to help education. And so they began to explore making investments in edtech startups.

The education landscape looked different, too. Concern about education continued to grow. Some people (including the U.S. government and corporations) worried that American students were falling behind their international counterparts. Others (especially parents) worried that their students were not learning to use the technology tools that dominated their out-of-school experiences.

The U.S. government's focus on demonstrating effective schools put an extraordinary emphasis on standardized test scores. While most educators and parents still felt education had broad goals, tying funding to test scores created measurable objectives, something akin to making a profit, that schools were compelled to deliver.

As Teach For America grew, many corps members left the ranks of day-to-day teaching but still wanted to support education. Many would wind up founding or joining edtech startups.

In 2010, a former hedge fund manager who had been using YouTube to tutor his niece who lived in another state also burst onto the public scene. Sal Khan and the Khan Academy became a worldwide free school, partly due to the support of

long-time education philanthropists, Ann and John Doerr and Bill and Melinda Gates. Their funding put a spotlight on Khan. But it was the embrace of literally millions of people who started using Khan Academy videos to learn that signaled a dramatic change in public attitudes toward education technology.

Khan would also inspire a radical change in higher education, too: in 2011, universities were rocked by the emergence of Massive Open Online Courses (MOOCs). The first three leading MOOC players that emerged were Udacity, Cousera, and what soon became renamed EdX. Encouraged by the success of Khan Academy, professors at Stanford and MIT started putting their classes online. Once again, millions (literally) of people showed up.

A triad of significant foundations began more actively funding technology in schools: the Bill & Melinda Gates Foundation, the Hewlett Foundation, and the MacArthur Foundation. They would be joined by a number of smaller foundations. Overall, philanthropic money devoted to "reforming" education would increase. And much like industry had turned to technology when it was forced to do more with less money, reformers looked to technology to bolster teachers. Joel Klein, who served first as chancellor of the New York City public schools and later as head of high-tech education company, Amplify, a division of News Corporation, told the New York Times:

> Between 1970 and 2010 we doubled the amount of money we spent on education and the number of adults in the schools, but the results are just not there. Any system that poured in as much money as we did and made as little progress has a real problem. We keep trying to fix it by doing the same thing, only a little different and better. This

> [referring to Amplify's technology] is about a **lot** different and better. (Rotella, 2013)

A number of charter schools, forced to operate on tighter budgets and eager to prove that their students could achieve great results, increasingly became the equivalent of early adopters or test beds for emerging technologies.

As such factors converged, a new generation of edtech entrepreneurs emerged, mostly young technologically savvy people inspired by the idea of building technology that could make difference.

In the summer of 2010, I was invited to a dinner provocatively called Hacking Education. It was the third dinner organized by a San Francisco-based entrepreneur, Jon Bischke. Bischke had started a web-based company in 2007 called eduFire that had aimed to help people, mostly out of school, learn things. By 2010, he had sold the company and was looking for his next venture. In the meantime, he decided to pull together a few friends he knew in the education space. His first dinner included about 15 friends; the second about 30.

The third dinner, the one I attended, turned out to be a packed house of about 70. A handful worked for startups; a larger number were keen to start something. Just about everyone had attended leading universities; only a few had any significant background in teaching. Some attendees worked for foundations; a few hoped to be investors.

As a long-time technology journalist, I had seen this pattern before. Many of the ingredients for an emergent industry seemed to be in place: social forces had created an opportunity; technology had finally evolved to be relevant; entrepreneurs and investors were starting to emerge. The last ingredient would be information. In other industries I had covered, a specialty information service emerged to help connect the entrepreneurs

with one another and their customers and to chronicle and define the landscape. Along with several cofounders, we started a weekly newsletter we called EdSurge shortly thereafter.

Edtech Redefined: An Industry Emerges

Between 2010 and mid 2013, several hundred firms devoted to building tools for education were created. Moe writes: "With over 127 private placement transactions completed, 2011 well surpassed transaction activity at the peak of the internet boom – when 106 education companies were financed in 1999" (GSVA, n.d.).

The number of startups has continued to rise. As of mid 2013, EdSurge had created the EdSurge Edtech Index, a snapshot of the technology companies serving schools (primarily K-12 schools). It catalogued about 650 companies; we figured there were at least another 400 to go, and more popping up every day.

Accelerators and incubators, organizations that coach entrepreneurs on how to turn their inspirations into business, helped accelerate the trend (see edSurge, n.d. for more information).

As of the third quarter of 2013, many of those companies were still young and starting to seek larger ("A rounds") of capital to support their growth. A host of efforts, including at groups such as the League of Innovative Schools, proposed to examine with some rigor the affect the technologies were having in classrooms (Digital Promise, n.d.). And that promises to make 2014 a genuine "show me" year.

Betsy Corcoran is co-founder of EdSurge, the go-to resource for news and information resource on edtech. She's an award-winning journalist who has worked for *Forbes*, *Scientific American*, and the *Washington Post*. Corcoran has been a featured commentator on many programs including "Forbes" on Fox, CNBC, NBC's "Press Here," and holds a bachelor's degree in economics from Georgetown University.

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