Let’s Teach Students to Innovate

It’s very likely that history’s future will be driven by those who, at an age of unparalleled innovation, actually let them discover they can learn something.

What creative, untamed minds paired with technology have made possible today was simply inconceivable to most of us a decade ago. The pace has indeed been dizzying.

And the growing pains have been there from the start.

In the pioneering days of technology in education—the late 70’s and early 80’s—were arguments about frills: Was color on a computer extravagant? Was sound frivolous and distracting? A major issue of debate in 1982 was whether word processing would help or hinder education. And in those days, we also weren’t talking much about different learning modalities. In an interview, psychologist B.F. Skinner states, “Computer graphics and animations aren’t really necessary…When you refrain from jazzing up a program to actually let them discover they can learn something.”

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But, as more educators, parents and employers are asking today, are we serving our students when we have them using technology to complete the same tasks that their parents did with pencil and paper? Are we training them for a real-world work environment where invention, discovery and the ability to think will be necessary skills for success?

At the core of innovation is the capacity to imagine the unimaginable. And as we move deeper into the 21st century where exponential leaps in technology may be the only predictable thing, let’s be sure our children are empowered with both the tools and the courage to innovate for an unknown future.

For the past 25 years, it’s been difficult not to focus as much on the new technologies—computers, multimedia, the Internet—as on the education of our children. We have been understandably wowed by the capabilities of all the new gadgets at our fingertips, and creative educators have found ways to enhance teaching and learning, streamline tasks and do much more with their assistance.

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Susan M. Walker
Editor in Chief

With thanks to the following who made this Special Report possible: Apple, AOL@School, Award Learning, CH time+, Compass Learning, Cognia, FAQs, Pearson Education.
We are proud to present 25 innovative people, products and initiatives that have shaped the landscape of education technology over the past generation.

The educators, leaders and innovations we’ve selected to profile here mark 25 of those who’ve been most successful at meeting the challenge of envisioning and preparing for an unknown future. They were chosen by a mix of readership studies, advice from advisors and other experts in the field, and also from the pages of Technology & Learning over the years. We’ve honored to salute these influencers, models and benchmarks, as tangible demonstrations of the magic that can occur when people take their dreams and work to make them reality.

Of course, it was a tough call to whittle down to 25 the many excellent choices from which we had to select. And by no means do the innovations we showcase here tell the complete story. Far from it. I the amazing educators, exciting products, cutting edge schools and groundbreaking initiatives we’ve covered over the years and continue to see on a daily basis are ongoing evidence of the dedication and inspired ideas that continue to drive key changes in education.

5 Who Led the Way

The following leaders represent a broad range of achievements in the world of education and technology. What they share, however, are the qualities of vision, courage, confidence, character and energy required to make a difference.

1. Seymour Papert

The name Seymour Papert might historically and accurately be more closely associated with the word “revolution” than anything else. The MIT professor and Piagetian psychology-trained Papert was a pioneer in his theory that learning in school ought to be as child centered and natural as learning in the real world. As early as the sixties, Papert was conducting research with kids and computers in his MIT lab, convinced that computers could be “instruments for learning and for enhancing creativity.” The Logo programming language was created in this lab, as well as a variety of children’s electronic toys. In 1980, Papert authored “Mindstorms: Children, Computing and Powerful Ideas,” long before the Internet had been established or word processing or even the Apple II was to be found in most schools. He publication exposed the idea that computers can help children “learn how to learn” and used the development of Logo as a “case study and prime example” (see Logo, page 7).

The official launch of Logo as a marketed software program that same year was to quickly inspire a nationwide “logomania” among educators, with a near cult-like proliferation of books and articles following, including such titles as “Logo Fever,” “Apple Logo in the Classroom,” “Logo: Not Just for Kids,” “Logo-phile” and hundreds of others. But Papert’s eye remained doggedly on the prize. He in interviews he warned that it would be “stupidly complacent to think the computer has come and that it’s going to solve our problems in education.”

In a 1983, Classroom Computer News (then a former name) Special Logo Issue, editor Peter Kelman laments the fact that Papert’s Logo software program designed as an open-ended “object to think with” was being squeezed back into the familiar mold of “school” with the wave of workbooks, multiple choice tests, and curriculum guides “replete with behavioral objectives” that overzealous educators were creating around the tool.

He concerns that Papert raised 20 years ago—among them, warnings of a digital divide, and the “standardization” of learning tools—which have proved prophetic indeed.

Today, Papert continues his dedication to learning and technology through his work at MIT’s Artificial Intelligence Lab, MaMaMedia, Inc., the LEGO MINDstorms product lab, and the Learning Barn, which focuses on methods of learning that are “too far ahead of the times for large-scale implementation.”

2. Steve Jobs and Steve Wozniak

It was at the Homebrew Computer club in Palo Alto that 27-year-old Steve Wozniak, an HP employee and dedicated digital electronics “hacker” and 21-year-old Steve Jobs were to begin a collaboration leading to the creation of the Apple Computer Company. With the Apple I micro-computer a trial run, the pair then hit the jackpot with the Apple II, which was to win the hearts and minds, and long-term loyalty of schools. In a 2000 interview with BusinessWeek, Jobs described the process which would eventually catapult Apple to the position of number one supplier of computers to schools:

“We at Apple sold the first computers [to schools] in the ’70s, but we were very frustrated, because at that time people didn’t understand how technology could help. So we started a program called “The Kids Can’t Wait” and helped author a bill in Congress [in the late ’70s] to give tax breaks for donations of computers to schools.

I went back to Washington for three weeks and walked the halls of Congress myself. The bill passed the House with a huge margin, but in the Senate, [former Senator] Bob Dole refused to bring it to a vote and it died.... The next year, California thought it was such a great idea that they passed their own law. Apple then gave a computer to every school [in California], and we got the software developers to do the same thing. This was the first mass deployment of computers in schools ever—and it was very exciting.”

Jobs’ then invention, the Mac, with its GUI interface, has had a dramatic impact on the entire computing world.

Apple continues todaystrong representation in the school market, with a range of classroom-friendly digital media tools and discounted software for education.

3. Bill Gates

Controversial though he may be, Bill Gates did do the job to drive reform in K-12 education over the past 25 years. Beginning with his development of the BASIC computer language for the Altair 8080 at age 19 back in 1975, Gates has displayed his yen for marketing and business in many a niche of the broader realm of technology.

Growing up in the shadow of Apple when it came to operating systems in schools, Microsoft’s DOS-based system was primarily seen as a “serious” business-based application accessible only to the more techie students with a motivation and love for “under the hood” programming. But with Microsoft’s controversial adoption of the Mac-compatible graphical user interface, especially in its later Windows 95 iteration, the PC became as broadly accessible to students and educators as the Macintosh.

With a base in schools to rival Apple’s, Microsoft began creat-
“Kathy Schrock has touched more in-the-classroom educators than any other person with her practical technology-related resources.”

15 Breakthrough Products

The following eclectic roster of hard-core software and emerging technologies were culled from my reader files over the years. Presented here is a chronological order, each of them remains a benchmark in their journey through the last generation of technology in education.

5 Logo

Long before the “personal computer” made educational games popular in most schools, at the Minnesota Educational Computing Consortium and elsewhere were building simulation games. Oregon Trail, created in 1971, as a senior project by Don Rawitsch and two other education students at Carleton College, took students on an authentic pioneering journey, asking them to make choices and solve “real world” problems such as finding food, hauling loaded wagons across rivers, and identifying dangers that ultimately determined their destiny in the wilderness. Originally, choices were made via teletype and the machine printed out the responses that came back over the phone line. Shooting was accomplished by asking the user to type “BANG” as fast as possible. Later, MECC created Apple II versions of Oregon Trail and succeeding versions, published by The Learning Company, and now Riverdeep, have withstood the test of time, evolving with the advancing technologies over the years. Oregon Trail is currently in its 5th iteration.

4 Apple II (1977)

Introduced in 1977 at the West Coast Computer Fair, the Apple II was the first pre-assembled “micro” Breakthrough feature to offer a complete computer on a card printed out the response that came back over the phone line. Shooting was accomplished by asking the user to type “BANG” as fast as possible. Later, MECC created Apple II versions of Oregon Trail and succeeding versions, published by The Learning Company, and now Riverdeep, have withstood the test of time, evolving with the advancing technologies over the years. Oregon Trail is currently in its 5th iteration.

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Anytime, anywhere learning,” in the mid-90s effectively helped to focus attention on the importance of mobile computing and 1:1 learning in schools. Perhaps most significant in recent years has been the Bill and Melinda Gates Foundation’s efforts on behalf of small school reform. In a demonstration of the power of committed philanthropy to spearhead real change, the past four years have seen the Foundation award more than $475 million to schools serving low-income and minority students across the country. The initiative continues to make “Reinvention Grants” to individual states and local urban reform efforts, and to use the high profile Gates name to generate the publicity necessary to keep the effort alive and in the public eye. The program’s goal is to help transform education so that all students learn more than basic skills. The program remains a benchmark in the journey through the last generation of technology in education.

4 Senators Rockefeller and Snowe

In 1994, Senators Jay Rockefeller (D-W.V.) and Olympia Snowe (R-ME) introduced the Telecommunications Act of 1994, commonly known as the E-rate, created deep discounts on 20 to 90 percent of the cost of Internet access for schools and libraries nationwide, making it possible for schools and communities in remote areas to connect to the worldwide web for the first time. With the change of the guard from the Clinton to the Bush administration, a decreased emphasis on the importance of technology in schools, and a few well publicized allegations of corruption and misuse, the E-rate program has come under fire and even now continues to have its livelihood threatened. Senator Snowe has kept up the fight for the E-rate, appealing to Secretary of Education Rod Paige to maintain the program’s independence from the larger education block grants which would require schools and libraries to apply through state education agencies rather than local agencies.

5 Kathy Schrock

A former librarian and current administrator, Kathy Schrock has founded the Snowe-Rockefeller American Telecommunications Education program. The initiative for technology for the Nauset Public Schools in Cape Cod, Mass., Kathy Schrock has perhaps touched more in-the-classroom educators than any other person with her practical technology-related resources. Celebrating its 10th year, Schrock’s online Guide for Educators (now eeryschool.com) originated in a card file box of categorized Gopher sites and was launched online when dial-up came to Cape Cod in 1995. The energetic educator taught herself HTML in a week, “mounted the pages,” and the rest is history. Maintaining the site from 5:45 a.m. and 9:30 p.m. daily, the educator features more than 20 of her own books on topics from developing a Web page to writing and research on the computer to building a technology-oriented media center. She also posts full content for more than 15 slide shows from her ongoing workshops on such topics as handheld technologies, information literacy, and using the Internet in lessons. In addition she has created templates for Web evaluation, assessment rubrics for digital projects, TeacherQuests, and supplies links to tens of online bulletin boards to encourage communities of practice.

6 The Oregon Trail (1972)

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9 Laptop Computers (1981)

Anyone remember the Osborne 1? Developed by Adam Osborne of Osborne Computer in 1981, it is considered the very first portable computer for the masses. Weighing a manageable 24.5 pounds but small enough to fit under an airline seat (with a screen that was only five inches), the $3,755 wundermachine flew off the shelves at a reported rate of 10,000 units per month. Throughout the decade Epson, Radio Shack, IBM, Compaq, Apple, and Zenith Data Systems followed suit with their own portable models.
Today, laptop—or one-to-one computer configuration—was found in school districts and even across states such as Maine and Michigan. Powerful results, now borne out in research, show students in laptop programs collaborate more, write more, and apply complex thinking skills more readily than other students. Teachers, too, are affected—adapting new roles as learners and facilitators.

Before the concept of laptop learning reached widespread adoption in the United States, however, it was being pioneered Down Under. In the late 1980s, long before "anytime, anywhere learning" was even a gleam in Microsoft's eye, a group of Australian educators had a prescient thought: how would education change if every child had a notebook computer?

In 1989, David Loader, then principal of the Methodist Ladies' College, a private girls school in Melbourne, and his colleagues launched the first-known laptop program. They started with one class, then expanded to include an entire grade level, and finally all (now-redesigned) grades in the school. By 1990, each fifth-grade girl was totting a Toshiba T 1000SE and using LearningMedia presentations across the curriculum.

Following their lead, several private school teachers introduced laptop programs. This movement spread to public schools in the mid-1990s. The laptop revolution in Australia, drawing attention from curious educators around the world, including a team of Americans who came in 1996 to observe what was happening. And the rest, as they say, is history.

The IBM Personal Computer (1981)

In contrast to Apple's proprietary technology, the IBM Model 5150 offered an open architecture that allowed it to work with third party add-ons from a range of vendors. Also, its comparatively simple design made it easy for others to do. The idea was that the more IBM imitations on the market, the more likely it was that IBM-type systems and the software that runs on them would become the business standard. This strategy spurred the development of thousands of brands of IBM clones, which lowered the price of computers in general and made them more accessible to schools.

Launched in the now-classic series of ads featuring Charlie Chaplin, the PC was followed two years later by the PCjr, designed especially for schools.

Bank Street Writer (1982)

The Bank Street Writer represented a groundbreaking change in the way people young and old used computers to write and edit. Developed with the help of the head of its-time Bank Street College of Education in New York, and sold through Scholastic, the accessible, user-friendly application became a common sight in schools across the country and went on to sell over 3 million copies. The April 1983 issue of Computer Classroom News (T.6.4's old name) reported: “The Bank Street Writer "allows users to correct spelling or grammar, revise or insert sentences, move paragraphs, and then print out a draft or final copy of their work with just a few simple commands" all for $95.

FrEdMail (1984)

The original idea of the Free Educational Mail Network was simple: to help students become better writers. Founded by enterprising San Diego teachers Al Rogers and Yvonne Andres in 1984, FrEdMail was an Apple II-based networking application that let educators and students from different parts of the country collaborate on projects and share resources. "FrEdMail was a Godsend," said Harold M. Brewer, superintendent of Montgomery County Schools in Maryland. "Just as I was learning the use of the computer and some Internet, here was this marvel that allowed two-way communication, free and at almost the same pace as the postal service. It would take two to three days for a message to get a turn-around, but it was the best thing going..." In 1993, FrEdMail Foundation became the Global SchoolNet Foundation, which has continued the vision of connecting a global electronic community in a way that opens the door of opportunity for teachers and students worldwide.

Multidisciplinary Programs (1984–)

In 1984, Apple introduced the Macintosh with much fanfare. Wrote former T&L editor Holly Bradly of the unveiling: "After building up much excitement about the new machine's architecture, [Steve] Jobs dramatically announced: 'FrEdMail was a Godsend. This marvelous application allows two-way communication, free and at almost the same pace as the postal service.'"

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By MECC and later Classroom Connect, a 1996 MayQuest newsletter describes the experience: "In the spring of 1995, a team of five explorers, led by Dan Buettner, bicycled to ruins in Mexico and Central America, met with on-site archaeologists, and attempted to unlock one of the most perplexing mysteries: the collapse of the ancient Maya civilization. But the team wasn’t alone: over 1 million kids, teachers and others from around the globe helped to lead the expedition by way of the Internet. Armed with hi-tech team equipment, the explorers linked to classrooms and computers around the world. Through the interactive experience, the team, chat with other kids and educators, view images from the journey and learn about the ancient Maya and contemporary Central America."
The University of Hawaii was using the first wireless LAN to connect their seven computers across four different islands via packet-based radio. But wireless was not widely useful and accessible at the time. The IEEE 802.11 standard emerged in 1997, paving the way for the proliferation of WANS in offices, homes, and schools. For schools in particular, it offered a practical solution to many common problems. One was the challenge of installing cable in older buildings or those with concrete walls and low floors. Another was the problem of wiring in portable classrooms that had sprouted up in so many venues due to overcrowding. But the main advantage to wireless was its liberating effect on education. Students and educators were no longer tied to desks and labs when online, but could move throughout the school and grounds.

Today, new wireless standards are evolving, and though issues of security remain major concerns, a ubiquitous wireless environment is undoubtedly in our future.

5 Initiatives that Changed History

Among the highlights of the past 25 years are the following programs that addressed major educational challenges and issues, creating broad ripple effects and heightening the national conversation around technology issues.

21 Technology Innovation Challenge Grants and PT 3 Partnerships

Take on rewarding technological innovation in the classroom: the President's Technology Innovation Challenge Grants and the Preparing Tomorrow's Teachers to Use Technology, or PT 3, grant program. While TICG focused on equipping schools with technology, PT 3 recognized the importance of getting educators up to speed on it. In its first year, PT 3 awarded $75 million to 75 projects to help education consortia to help address the challenge of teaching teachers how to the national level. It also was the first time a presidential initiative took steps to ensure America stayed ahead of other nations in terms of technology in schools. The TICG program stemmed from the Improving America's Schools Act in 1994, which pledged $2 billion over a five-year period to help states and communities integrate technology into schools. The section of this law known as the Technology for Education Act created the TICG program, and the program was set up to dole out $5 to $10 million grants. In its heyday, the program supported partnerships among educators, business and industry, and other community organizations to develop innovative applications of technology and plans for fully integrating technology into schools. The program also targeted the underprivileged, providing competitive five-year awards to consortia that included at least one local educational agency with a high number or percentage of children living in poverty. Although the program was K–12 in focus, its consortium requirement required grantees to collaborate between K–12 schools and higher education. As a result, between 1995 and 1997, 62 TICG projects were funded nationwide. From 1998 to 2000, the government funded their last grants in its original form.

In 1999, as TICG was winding down, the Department of Education released the report "Innovations that Take on Rewarding Technological Innovation in the Classroom: the President’s Technology Innovation Challenge Grants and the Preparing Tomorrow’s Teachers to Use Technology, or PT 3, grant program. While TICG focused on equipping schools with technology, PT 3 recognized the importance of getting educators up to speed on it. In its first year, PT 3 awarded $75 million to 75 projects to help education consortia to help address the challenge of teaching teachers how to

SPECIAL REPORT: SALVATING INNOVATION
NetDay was designed as a comprehensive effort to bridge the digital divide. The initiative began in 1995 as a year-round effort to help experienced and pre-service educators integrate technology into instruction to help students’ higher-level thinking skills and enhance learning. Through the program, educators take advantage of collaborative Web-based “communities of practice” to learn from colleagues about best practices in harnessing technology to enhance the education experience and drive reform. In addition, they experience new approaches to creating assessment tools and aligning lessons to learning goals and standards.

The Intel Teach to the Future program began in the U.S. but has since welcomed teachers from more than 30 countries including Argentina, China, India, South Africa, Russia, and the United Kingdom, to name a few. When international educators get involved, Intel often collaborates with ministries of education or other government entities to adopt the curriculum for each location. So far, the program has trained more than 3.5 million educators; by 2006, Intel expects the program to train more than 25 million worldwide.

NetDay, much like the E-Rate, was designed as a comprehensive effort to bridge the digital divide. The initiative began in 1996 as a year-round grass-roots volunteer program by companies, educators, families, and communities to wire the nation’s classrooms for Internet access. Between 1996 and 2001, more than 500,000 volunteers affiliated with NetDay wired more than 76,000 classrooms in 40 states. Today, NetDay is an effort spearheaded by an anonymous nonprofit organization that works with other national organizations to help schools and communities incorporate technology into instruction and school management. Officials credit the organization with bringing Internet access to almost 99 percent of K–12 schools across the country.

Specifically, NetDay community initiatives provide direct service to more than 25,000 students in 25 schools in five different underserved communities. Through the NetDay Technology Enhances Student Success program, the organization provides direct monitoring and coaching to help teachers learn how to use technology to improve student achievement in Mississippi. Through the NetDay America Corps bridge, NetDay recruits AmericaCorps volunteers to dedicate a year of services to help bridge the digital divide for schools in underserved communities around the country.

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Virtual School Initiatives

Since the 1996 pioneering efforts of The Concord Consortium’s Virtual High School and the Florida Virtual Online High School, now the Florida Virtual School, e-learning has been growing at an exponential rate. Instigated as a problem-based solution, the virtual schools grew from a variety of needs. Overcrowded schools in swiftly growing districts, enrollment demands in high need courses, such as Algebra, the need for Honors and AP courses to be available to students in remote and rural areas, keeping job seeking students from dropping out—all these were and are addressed by the flexibility of the online courses. The Florida Virtual High School, whose motto is “any time, any place, any path, any pace” has become a national model for a statewide initiative. In 2000, the Florida State Legislature established FLVS in state law as an independent educational entity with a gubernatorial appointed governing board. Today, FLVS develops and provides curriculum for schools all across the nation, specializing in grades 6 to 12, as well as adults seeking GED alternatives. Enrollment for the 2003-2004 School Year exceeded 21,000 students. The school offers more than 80 courses—everything from GED to honors to Advanced Placement courses. It is accredited by the Southern Association of Colleges and Schools, and all of its courses are accepted for credit and transferable. Courses are delivered over the Internet, and teachers communicate with students and parents on a regular basis by phone, email, instant messaging, and discussion forums. The school employs more than 200 teachers, and has trained more than 1,500 educators. The school is accredited by the Southern Association of Colleges and Schools. Today, NetDay is an effort spearheaded by an anonymous nonprofit organization that works with other national organizations to help schools and communities incorporate technology into instruction and school management. Officials credit the organization with bringing Internet access to almost 99 percent of K–12 schools across the country.

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Celebrating 25 Years With Technology & Learning

As Technology & Learning Magazine moves through its 25th year of publication, we are happy to be bringing readers a three-part series of Special Anniversary Reports. In its entirety, the series is designed to showcase the greater impact of digital technologies on education over the last generation. In this second report, “Saluting Innovation” we celebrate the leaders, ideas, schools, solutions, and initiatives that have been major influencers in shaping the vision and practice of technology in education.

Our first report, “Celebrating Students,” delved into the personal stories of nine children whose lives have been profoundly touched by today’s technologies. These inspiring narratives serve to illustrate the power of technology to motivate, to challenge, to lift and ultimately to impact forever the destiny of an individual.

Here are highlights from a few of our student stories:

- Seventeen-year-old Prum, the seventh of 10 children born to Cambodian immigrants, went from skipping school and feeling isolated from his parents to gaining ... and direction through his exposure to digital photography and documentary film production. Prum’s work in the digital arts earned him a position as a production assistant in a documentary project on Culture Clash, a trip to American Samoa to teach middle and high school age students, and most importantly, the understanding and respect of his parents.

- Spurred on by her teacher, Neme Alperstein, 10-year-old Alyssa crafted an incredibly rich and comprehensive resource on how she had lived with epilepsy since age six. Alyssa’s Web site explains what epilepsy is, talks about how it’s treated, includes a movie on her visit to her neurologist, invites input from similarly afflicted youngsters, and also features her own (heartbreaking) graphical pictorial depiction of a young girl with probes attached to her forehead.

- Ali, who immigrated to America from Pakistan at age 10, was lost in the large urban environment of the New York City public schools. He was unmotivated ... all that. MOUSE (Making Opportunities for Upgrading Schools and Education) is a New York City-based non-profit dedicated to empowering students. Ali’s experiences in the MOUSE Squad allowed him to have an outlet for his nascent interest in computers. He has been able to exercise his interest in graphic design and digital art. He’s also learned about technological terminology, networking, servers, and troubleshooting.

- In 2003, four high school students from the Tashkent International School in the country of Uzbekistan confronted the issue of their nation’s human rights problems head on by researching the topic and publishing their findings on the Web. The site, “Uzbekistan: Opaque Reality,” was created as an entry for the non-profit Global SchoolNet’s Doors to Diplomacy student competition.

Other highlights from our first issue include student “Dear Mr. President” letters collected in an online survey by the non-profit NetDay. The heartfelt letters showcase the crucial role that technology plays in the lives of students today. You can read the complete stories and hear the first person voices of these remarkable students in the “Celebrating Students” special report on our Web site at: http://i.cmpnet.com/techlearning/pdf/25yrs/25thAnnivReport1.pdf.

Don’t miss our final 25th Anniversary Special Report: “Envisioning the Future” Stay tuned for our next special report due out in November 2005. In “Envisioning the Future,” Technology & Learning editors, futurists, and those on the cutting edge of science and technology will take an in-depth look at how technological innovations are likely to change the landscape of tomorrow.

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