

PLATO: How an educational computer system from the '60s shaped the future

Enlarge / PLATO IV Terminal, ca. 1972-74.
University of Illinois Archives

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Bright graphics, a touchscreen, a speech synthesizer, messaging apps, games, and educational software—no, it's not your kid's iPad. This is the mid-1970s, and you're using PLATO.

Far from its comparatively primitive contemporaries of teletypes and punch cards, PLATO was something else entirely. If you were fortunate enough to be near the University of Illinois Urbana-Champaign (UIUC) around a half-century ago, you just might have gotten a chance to build the future. Many of the computing innovations we treat as commonplace started with this system, and even today, some of PLATO's capabilities have never been precisely duplicated. Today, we'll look back on this influential technological testbed and see how you can experience it now.

From space race to *Spacewar*

Don Bitzer was a PhD student in electrical engineering at UIUC

in 1959, but his eye was on bigger things than circuitry. "I'd been reading projections that said that 50 percent of the students coming out of our high schools were functionally illiterate," he later told a Wired interviewer. "There was a physicist in our lab, Chalmers Sherwin, who wasn't afraid to ask big questions. One day, he asked, 'Why can't we use computers for education?'"

The system should be, in Sherwin's words, "a book with feedback."

The question was timely. Higher education was dealing with a massive influx of students, and with the Soviets apparently winning the space race with Sputnik's launch in 1957, science and technology immediately became a national priority. "Automatic teaching," as it was conceived, attracted interest both from academia and the military. Sherwin went to William Everett, the dean of the School of Engineering, who recommended that fellow physicist Daniel Alpert, head of the Control Systems Laboratory, assemble a group of engineers, educators, mathematicians, and psychologists to explore the concept. But the group ran into a serious roadblock in that the members who could teach were unable to comprehend the potential technologies required, and vice versa.

Alpert became exhausted after several weeks of fruitless discussion and was about to terminate the committee until he had an offhand discussion with Bitzer, who claimed to already be "thinking about ways to use old radar equipment as part of an interface for teaching with a computer." Using grant funding from the US Army Signal Corps, Alpert gave him two weeks, and Bitzer went to work.

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For the actual processing, Bitzer used the University's pre-existing ILLIAC I (then just "ILLIAC") computer. It was the first computer built and owned entirely by an educational institution, and it was a duplicate of the slightly earlier

ORDVAC. Both were built in 1952, and they had full software compatibility. ILLIAC's 2,718 vacuum tubes gave it more computing power than even Bell Labs had in 1956, with an addition time of 75 microseconds and an average multiply time of 700 microseconds, 1024 40-bit memory words, and a 10,240-word magnetic drum unit. Bitzer worked with programmer Peter Braunfeld to design the software.

Enlarge / PLATO I terminal in 1960.

The Wide World of Computer-Based Education (Bitzer, 1976)

The front end was a consumer TV set wired up with a self-maintaining storage tube display and a small keypad originally used for the Naval Tactical Defense System. On-screen slides appeared from a projector under ILLIAC's control and were manipulated by the control keys, and ILLIAC could overlay the slides with vector graphics and text at 45 characters per second via what Bitzer and Braunfeld called an "electronic blackboard." The system offered interactive feedback at a time when most computer interaction was batched. The computer was christened PLATO in 1960 and was later backronymed as "Programmed Logic for Automatic Teaching Operations." Only one

user could run lessons at a time, but the prototype worked.

Enlarge / PLATO II block diagram.

US Office of Naval Research's Digital Computer Newsletter,
October 1961-April 1962

The concept rapidly expanded. In 1961, PLATO II emerged, offering a full alphanumeric keyboard, plus special keys based on the PLATO I's. These keys included CONTINUE (next slide), REVERSE (previous), JUDGE (check if an answer is correct), ERASE, HELP (for supplementary material or to reveal the answer), and the interesting AHA key for when the student might "suddenly realize the answer to the main-sequence question" and decide to answer it immediately.

Its biggest innovation, though, was time-sharing, allowing multiple students to use the system simultaneously for the first time. Careful programming was required for user time slices so that each session would not drop keystrokes. Unfortunately, ILLIAC's memory capacity held back this advance, limiting system capacity to just two users at a time and restricting interactivity by capping "secondary help

sequences.”

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