ARTISTS *SHAWN MAXIMO WITH JUSTIN SIMON*
ERICH HARTMANN

CURATOR *CANDICE STRONGWATER*

CLASSROOM ARSENAL

CATALOG ESSAY

The U.S. Department of Education has long relied on technology corporations and their models of telepresence during national crises, enlisting radio, TV, and now digital platforms to facilitate communication. The theory and practice of how educational technologies (or, edu-tech) could be used as teaching aids first emerged in the 1960s amid the so-called cognitive revolution.[1] An early postwar edu-tech precedent is NBC's tele-learning series Continental Classroom (1958–63), which represented a pioneering collaboration between the U.S. Department of Education, U.S. Department of Defense, and a media conglomerate as a preparatory effort to enhance science education due to the Cold War arms race.[2]

During the current school closures caused by the COVID-19 pandemic, enterprise technology corporations—including Google, Zoom, and Microsoft—have become crucial business partners to the public and private education sectors. They act as emergency mitigation platforms, vital to the continuation of learning and the operation of the entire educational infrastructure. At the start of the pandemic in the U.S., state-mandated school closures affected at least 50.8 million public school students. The speed and magnitude of these shutdowns were unprecedented, but the effects on students have varied widely based on school district and families' financial, logistical, and emotional capacity to transition their children to virtual or hybrid learning enviornments. While the belief in edu-tech as an all-encompassing classroom management system continues, so does the inability of technology corporations to fully acknowledge the existing social and economic inequalities in education. The pandemic is also highlighting tech companies' resistance to recognizing new problems introduced by technology that cannot necessarily be solved with machines.

Through historical materials and a newly commissioned work, Classroom Arsenal questions what is at stake in our reliance on these companies that mediate learning and educational efficacy. While the exhibition examines both the explicit and implicit roles of edu-tech within this current paradigm of virtual learning, Classroom Arsenal more broadly concerns the overreliance on technology corporations to innovate the tools and infrastructure needed for an increasingly decentralized and technologically dependent student body.

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Classroom Arsenal borrows its title from Douglas D. Noble's 1991 book investigating the influence of military research on postwar American public education, framed within the histories of computer science, cognitive science, and artificial intelligence (AI).[3] A public school teacher, technology historian, and computer programmer who wrote extensively on edu-tech policy throughout the 1980s and '90s, Noble was uniquely situated to speak on both the language of computers and educational theory. In the 1980s, as blue-ribbon commissions promising computer-based education began to inundate schools, Noble noted the almost overnight heralding of "computer literacy" as an "inevitable basic skill," which he believed was a kind of "ideological campaign."

In Classroom Arsenal: Military Research, Information Technology and Public Education, *Noble charts the darker contours of the classroom from the viewpoint of companies like IBM and the Massachusetts Institute of Technology, who were using the classroom as a testing site for military and tech research.[4] According to Noble, the classroom operates across five functions, providing:*

> A stockpile of technological paraphernalia; an assemblage of people and machines idealized as a smoothly-running technological system; a production site for the manufacture of human beings as species of information processing technology; a laboratory for research on human performance; and a locus of legitimation and funding for psychological research.[5]

In short, Noble identified how enterprise corporations view classrooms not as spaces of learning that they wished to improve, but rather as sites of technological testing on human subjects in a closed system. Like Noble, this exhibition questions the motives of tech corporations when they are involved in structural changes that are made almost overnight without consent or community oversight. We now know from the rocky trial-and-error period of the last year that the classroom is a necessary site, and that virtual learning implemented on a massive systemic scale exacerbates social issues that cannot be problem-solved through technology.

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Organized at a heightened moment when the concept of the physical and virtual classroom is being profoundly reevaluated, Classroom Arsenal presents three distinct components that span the epoch that gave rise to educational technologies. Spatially, the exhibition has no intended chronology—it is meant to be experienced like a revolving door, providing glimpses into one of the many genealogies of technology and education. The first gallery acts as a historical portal, exhibiting archival documentation from the 1964–65 New York World's Fair, including the Hall of Education and the pavilions of IBM and Bell System—two telecommunications corporations fundamental to the development of the edu-tech market. The IBM Pavilion's centerpiece was the newly released 360 series computer, while Bell presented the "see-as-you-talk" Picturephone.[6] These two technologies have since become a scaffolding for today's virtual education. Together, these materials explore how the relationship between educational and technological structures in our own vexed moment emerged from the Cold War anxieties of the postwar period, and the illusory promise of innovation spurred by the period's enthusiasm for technological change. Crucially, they also show how innovations for "the future" were designed by and for a largely white, middle-class, able-bodied user.

In the black box gallery, Shawn Maximo's (b. 1975) work responds to the contemporary edu-tech moment through a newly commissioned immersive video installation that imagines the architecture of corporatized education-scapes through real and rendered footage. In Untitled (Classrooms), Maximo uses both real and CGI-rendered footage to consider the classroom as the progressive hardware of the education system, with students embodying its ever-developing software. The last gallery presents little-known photographs of IBM's computer hardware by Erich Hartmann (b. 1922; d. 1999), the company's long-time in-house photographer. Taken in the late 1970s and early '80s amid the rise of digital computing, his photo series Objects of Technology poses an alluring yet ambivalent faith in the logic of efficiency and innovation. Hartmann's photographs could be interpreted as a macro-examination of the literal building blocks of "telecommunications" and the complicated components that compose these perpetually "upgraded" devices and consumer commodities. Hartmann focuses on the power of marketing and the aestheticizing of technology, perhaps as a way to conceal its inner and outer workings.

COVID-19 has exacerbated issues around educational attainability due to racial and economic disparities, which affect access to everything from stable internet and media devices to physically and emotionally safe places for learning. At an inconclusive moment and as the pandemic perseveres, Classroom Arsenal reflects on the histories, protocols, and networks of an education system influenced by corporate interests, technological efficiency, and notions of "progress."

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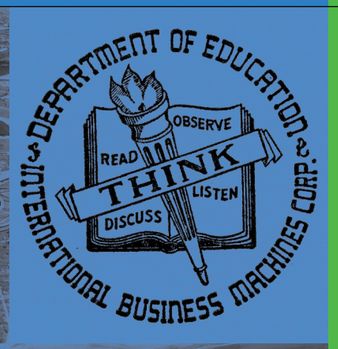
1. From the Victorian era onward, Western society considered education to be an authoritative relationship between the input-output of information (i.e., students as containers into which facts are poured). The understanding of education then shifted to a more student-centered approach, in terms of how children learn. In the late 1950s as part of the cognitive revolution (also referred to as the cognitive science movement), these educational interests were explored alongside research led by scientists, educators, and psychologists seeking to understand how knowledge is produced and transferred, and through what means.
2. During the Cold War era, as the country prepared to build up the population's math and science literacy, and as the larger "edu-defense" network for the space race was being developed, Continental Classroom became one of the first instances of a TV program being used as a country-wide teaching tool. This program was, however, short-lived.
3. Douglas D. Noble, The Classroom Arsenal: Military Research, Information Technology and Public Education (Abingdon, UK: Routledge, 2018).
4. Other companies with intersecting military, technology, and pedagogical agendas included Xerox PARC, the RAND Corporation, Simulmatics Corporation, and Bell Labs. These activities were part of the larger atmosphere of cybernetics, which focuses on a systems theory that illustrates how biological systems can be

1964–65 NEW YORK WORLD'S FAIR



With a heightened focus on science education, the World's Fairs of the Cold War period employed futuristic architecture, audiovisual rides, performances, and an overall method of aesthetic engagement that fit under the optics of family fun and leisure. These tactics were perhaps best exemplified by the Expos of Brussels 1958, Seattle 1962, Montreal 1967, and Osaka 1970, as well as the 1964–65 New York World's Fair, where displays of war technology, science, and educational technologies were placed front and center.

Under the banner of "Peace through Understanding" and "Man's Achievement on a Shrinking Globe in an Expanding Universe," the utopian mottos of the 1964–65 fair were nearly antithetical to the social realities of the 1960s. Happening amid the Vietnam War and the civil rights movement, the fair was marked by demonstrations organized by the Congress of Racial Equality on opening day and during its two-year run. This context is also representative of a period when education and schooling on a global scale were undergoing pedagogical experimentation with architecture and curriculum design, and new technologies were debuting as enhancements to human relations and connectivity on what was becoming a "shrinking globe."

Today, the Unisphere, the Hall of Science, and other relics of the fair in Corona, Queens, represent an obsolete technology and a once burgeoning "experience economy." These relics are also situated within the site's histories of colonialism and racialized urban planning practices, which are often ignored in favor of remembering the fair's sunny vision of democracy and technology.

Left to Right:

Aerial view, Flushing Meadows Corona Park 1964 World's Fair, 1966. NYC Parks Photo Archive.

U.S. Department of Education and IBM logo. 1946. © IBM.

Bell System Laboratories' Picture Phone Service at the 1964–65 New York World's Fair, 1964. Queens Museum, New York.

School of Tomorrow, 1964. Queens Museum, New York. © Frederic P. Wiedersum Associates, Valley Stream, N.Y.

SHAWN MAXIMO

Commissioned on the occasion of Classroom Arsenal, *this video installation by Shawn Maximo considers the classroom as the hardware of the education system, with students embodying its ever-developing software. Informed by his background in design, architecture, and branding, Maximo's practice invites visitors into fantastical spaces to confront topics from automation and urban planning to the social contract and the dark web.*

In Untitled (Classrooms), *Maximo presents a series of education-scapes featuring the different grade levels of the U.S. school system: pre-kindergarten, elementary school, middle school, and high school. The work combines histories of progressive schoolhouse architecture, such as the 1930s "test tube" models and the 1970s "open classroom," with pedagogical strategies used in game-based learning. These simulations—ranging from work-study to living-room learning environments—experiment with how spatial arrangement, material, color, interface, and sound are all crucial factors in modifying and commodifying behavior. Developed in collaboration with musician Justin Simon, the score was generated from sculpting sonic hues, including pink and white noise and isochronic tones—sounds hypothesized to enable brainwave entrainment (synchronization to external stimuli), and to optimize concentration and engagement.*

Maximo's work stages scenarios where students remain agents of their own navigation of the education system, exploring the extent to which highly designed spaces can be overridden by their occupants.

Untitled (Classrooms), 2021

Single-channel video installation, 4 minutes, gaming chairs, with vocals by Susan Gjenvick and soundtrack by Justin Simon.

Special thanks to Leela, Yve, Dori, Lucien, Bodhi, Gus, Niko, Metta, and Ashley.

ERICH HARTMANN

On view in the last gallery, this series of photographs by Erich Hartmann spans the late 1970s to the mid '80s and includes images of IBM machine components, such as computer circuit boards, typewriter key guides, and the cable wires of a modem. Hartmann photographed the hardware of telecommunications as futuristic, sleek, seductive, and posthuman objects. The imagery seems to predict the commercial tech landscape that would soon come to be saturated by consumer technologies and new aesthetic strategies for advertising. The objects appear as anatomized machine bodies, revealing what lies beneath the modern communications technology that houses the software of efficiency and connectivity.

In a text on the series he wrote in 1983, Hartmann hints at an all-encompassing future where technology acts as the mainframe of society: "I take comfort from the idea of imperfection: it is evidence of the strong (and, if we are lucky, permanent) condition of any human endeavor to reach a goal completely. I am annoyed when trains are late, but I am afraid when they are on time—without fail."

Objects of Technology, 1970s–1980s

Erich Hartmann, Objects of Technology, *1982. IBM integrated circuits, power amplifiers for an IBM computer (U.S.). © Erich Hartmann/Magnum Photos.*

PHOTOGRAPHING TECHNOLOGY: Imperfections

In our lifetime we have passed from the Mechanical Age - in which machines imitate and amplify the dexterity and strength of the human body to perform useful material work - to the Electronic Age - in which tiny electronic circuits perform some of the primitive logical functions of the human brain - such as adding, sorting, comparing and others - in very large numbers, at very great speed and more reliably than humans do such repetitive work. Collectively this is a technology in which machine systems are no longer controlled by human beings directly, but by computers which are, finally, controlled by human beings.

Compared to the artifacts of the Mechanical Age the photographing of electronic objects is complex and demands another point of view. On first look, there is little to photograph: the essential function of computers is the movement of electrons from one tiny bit of silicon to another,invisibly. Once assembled, computers are encased in arbitrarily painted bland boxes which reveal little of the functions within. One sees a few lights flashing, one hears a hum, a typewriter writes without a human presence...

It is only when one approaches the making of computers, and the myriad of other components of modern technology, with the desire to look beyond surface photographic description that interesting things begin to happen: one discovers an order of physical scale quite unlike that in the "real" world; one finds parallels between the (purely functional) shapes of such esoteric modern objects as a micro switch and contemporary sculpture; one begins to realize that, no matter how mysterious or impenetrable may be the object before the camera or the process by which it is being made, it still bears a profound family relationship to other aspects of human creation and a corresponding signature of imperfection.

For reasons beyond the photographic I take comfort from the idea of imperfection: it is evidence of the strong (and, if we are lucky, permanent) condition of any human endeavor never to reach a goal completely. I am annoyed when trains are late, but I am afraid when they are on time - without fail.

Erich Hartmann

Erich Hartmann, Photographing Technology: Imperfections, *1983. Typed letter. Courtesy Magnum Foundation Archive.*

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DESIGN

Erin Knutson with Serena Chen.

made predictable through technologies that control.

5. *Noble, The Classroom Arsenal, 8.*
6. *Part of SAGE (Semi-Automatic Ground Environment), the world's largest computer project and the first air defense system, IBM and Bell were joined by other organizations that built computer hardware and software: Western Electric, MIT's Lincoln Laboratories, and the RAND Corporation, to name a few.*