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Practicing at Home: Computers, Pianos, and Cultural Capital

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Last week, Time Warner sent an installer to my home to set up the digital cable boxes and my DSL line. I've moved often in the last three years, so I have been in this situation a lot. First, a young man of about twenty arrived and got to work on the cable lines under the house. Then, he called his friend, because he was having trouble with the DSL line setup. This young man, Marco, could handle three different kinds of TV remotes and their interaction with each other in seconds. When we turned to the DSL box, it took him only a moment to find the system preferences and get the Mac laptop set up. He looked around the room, where three other Macintosh laptops were visible. "Man, I don't even have one yet," Marco tells me. "Wow. You've got Bluetooth on this. Do you download songs to your phone from this?"

The expert on DSL lines of the Time Warner installers working in my area does not own a computer, and my family (one parent, three kids) has six of them and that's not counting the old ones in the garage. Why does Marco have no computer and I have six? Because I am better with technology? Obviously not, for I could never begin to set up my own DSL connection, much less go from house to house troubleshooting computer connections all day. Because I recognize the importance of digital media and he doesn't? Wrong again, because Marco works for Time Warner and witnesses the proliferation of DSL and computers, as well as the links between these and all forms of home entertainment on a daily basis. He probably recognizes the significance of these shifts in technology usage better than many of my colleagues who are university professors. Do I have so many computers because I am an excessive consumer typical of white-collar Anglos? Some of this could be true, but I didn't buy most of my computers, my employers did—in my sphere of work, computers are handed out like candy, updated constantly, and everyone is expected to transport and use them 24/7. At Time Warner, Marco is not getting the same benefits. Because Marco's job requires a narrower skill set, and that skill set as defined by Time Warner is kept at its lowest possible level to hold down costs, no matter how much Marco knows, he is paid by the hour or by the installation.

When Marco looks at my computer and its Bluetooth capability, he sees a music machine, and a piece of technology he cannot afford despite the fact that his capacity to use it may well be superior to mine. When I look at my computer, I see endless files to read, endless files I am under deadline to write, and a means for my workplace to send me more work. This is the privilege of a Ph.D.

How is knowledge of digital media converted into educational or occupational advantage? There has been surprisingly little attention to substantive content in digital pedagogy. In

far too many school settings, students' multimedia presentations of very traditional content that is restricted to fit curricular standards (book reports, science projects, autobiographical essays) has substituted for more imaginative and more critical pedagogy. Along with standardized testing and back-to-basics reforms, computers have contributed to the trivializing of the content of the curriculum and the work of teachers in ensuring the quality of the substance of schooling. We need to examine current digital pedagogy in terms of unarticulated and implicit models of labor and the job prospects that students, parents, and teachers imagine computer skills will lead them to. There are clear benefits that access to technology can bring to disheartened and disenfranchised student populations. Computers can be a hook to do more sustained academic work for working-class students of color. Yet, the process of education cannot be made more cost effective through technology, and computers cannot teacher-proof the classroom. The enthusiasm among school board members and local business communities for high technology in public education was based on a desire to teacher-proof the classroom.

Teaching with computers requires a smaller teacher-to-student ratio than conventional classrooms. The legacy of the last decade of technology implementation in public schools in the United States has firmly established new markets for hardware and educational software makers, and entrenched a new tier of digital pedagogy consultants and experts in using computers for teacher and student management. How much it has improved learning and the quality of relationships between teachers and students remains to be seen. Students and parents are strongly attracted to schools with better technology, and now that the grant money of the dot-com boom has dried up, school districts are left with prohibitive costs to maintain and upgrade existing systems. These costs are impossible to cover in working-class urban school districts. These same students are on the losing end of the home technology divide.

Yet parents and students tend to rate schools in terms of technology, and magnet or charter schools that offer high technology can be a powerful draw. What types of employment does high technology prepare students for? How have corporate needs rather than pedagogical goals gained a foothold in our discourse around public education? In what ways have we set up unrealistic expectations for digital pedagogy as a magic bullet to solve the complex and historically rooted challenges facing public education today. By employing sociologist Pierre Bourdieu's categories of economic, cultural, and social capital to digital literacy, I wish to describe the barriers that make the dream of winning something like a "cool job" in new media a very distant one for working-class students. These include a reliance on public computers rather than domestic ones, a lack of access to prestigious educational credentials, and an exclusion from the social networks crucial to employment in the "new" economy.

Bourdieu focused attention on the role of education and the influence of "status distinctions" on the selection and valorization of certain cultural forms. He described the purpose of his project as being "to grasp capital . . . in all of its different forms, and to uncover the laws that regulate their conversion from one into another."[1] Although Bourdieu did not write about digital media per se before his death in 2002, he often referred to distinctions regarding musical taste, aptitude, and talent. He was also a keen observer of status distinctions in education and how these translate into job markets. Through an extended analogy between the piano and learning to use computers, I demonstrate Bourdieu's relevance for an expanded vision of digital literacy—one that would be at the forefront of the material and social inequalities that define children's lives in the United States in the twenty-first century. In what follows, I draw out the similarities between learning to play the piano and learning

to use computers. The analogy helps to emphasize the privileged role of early domestic learning in gaining the "right" skills, the kind of competence that seems to come naturally and is therefore of higher status than what is learned at an institution such as a public school.

Musical education has a longer history, and the work on music education is less surrounded by hyperbole at the moment than work on digital media learning. During the heyday of piano marketing, however, as a necessary piece of bourgeois furniture, there was considerably more hyperbole about the wonderful effects on a child's life of the mere copresence of the instrument in the home.[2] Today, new research on early cognitive development is rekindling the interest in early music training and its power to enhance mental capacity. While advocacy (and Steinway advertisements) for musical training commonly took the form of a cultural uplift argument in mid-twentieth century American culture, today the argument is made in terms of brain science and the urgency of early cognitive development. Pregnant mothers are urged to play classical music to reach their child in utero, and Baby Mozart has made a handy profit exploiting brain science claims of the injection of higher intelligence through exposure to classical music. Traditionally, elite private schools (and some parochial schools) have offered excellent music education. Public schools in the United States added more music education in the 1960s, to appeal to baby boom parents and in response to demands for pedagogical liberalization and even democratization. However, music has been taught unevenly in public schools, and today, resources for music education in pubic schools are almost entirely dependent on massive parent-run fundraising efforts. No one expects a concert pianist to emerge from the casual training of the public elementary school.

While public schools are brimming with musical talent in other genres—hip hop, pop, Latina, and so forth, most of it is taking place outside the classroom, and much of it involving the impressive manipulation of electronic and digital technologies. The status of the classical music canon—what music historians define as European art music from the eighteenth and nineteenth centuries—and its preferred association with intelligence remains the most prestigious and the most difficult to master without access to expensive instruments and formal training.

In many ways, digital learning resembles classical music in that it has "barriers to entry," to borrow a term from free-market economics, that are primarily financial. The cash outlays involved in providing computers for children have been overlooked in the burst of enthusiasm for how mere association with computers will lift children intellectually and magically increase their potential value as adults. There is an overestimation of access to computers in terms of economic class, and an underestimation of specific forms of cultural capital required to maintain the systems themselves and move beyond the casual, recreational uses of computers to those that might lead directly to well-paid employment.

The miraculous benefits of digital learning are now expected to overcome entrenched educational inequalities that result from decades of class- and race-based resourcing to public schools—what Jean Anyon has called the pauperization of urban school districts.[3] In states such as California and Texas, the high-technology focus of the economy placed a new and Sisyphean burden on the public school system.[4] Added to the expectations for schools were the demands of a corporate elite, as in the case of San Diego's High Tech High, supported by the founders of Qualcomm and Microsoft. These philanthropic efforts disguise, in many ways, the ratcheting-up of blame on public school systems, and the top–down imposition of controls and penalties that ignore the expertise of teachers in terms of pedagogy and understanding children's development. The demand for a revision of the school curriculum based on corporate management philosophies and an emphasis on technology training for

Figure 1
In this advertisement for Steinway pianos from the 1940s, celebrated pianist Josef Hofman gives a tip on technique to the young boy practicing at home on his baby grand piano.

the shift to a knowledge economy has resulted in the installation of a new set of experts—many of whom have little understanding of the history and economics of the U.S. public school system, and no experience in the local community context in which teachers, parents, and students struggle.

Pierre Bourdieu's work on the ways that status systems are reproduced in education and the labor market highlights the decisive role that social networks play in providing encouragement, assistance, and recognition to learners, and in conferring legitimacy on what has been learned, including helping students to perceive its value and status. This analogy of the piano and the computer helps to pinpoint some of the buried assumptions in the most optimistic projections of digital literacy among youth, as well as focusing on the daunting material and pedagogical issues involved when schools prioritize the digital over more traditional materials, such as books.

Economic Capital

The provision of the musical instrument involves much more than the basic cost of purchase or rental. Is there room at home to play? Is the dwelling spacious enough to provide sufficient separation from other family members, and from neighbors who might be bothered by the noise? The bigger the family, the cheaper and denser the housing, the more difficult it becomes to keep a piano at home. The piano movers will cost more if the piano is to go

upstairs or through the narrow doorways of multiple-family housing units. The piano tuner is an additional expense: the older and cheaper the piano, the more it has been transported and used by multiple musicians, the more piano tuning and repair are required to play in key. One student I interviewed explained how her parents, Taiwanese immigrants working double shifts and extra jobs to make it in the Californian economy of the 1980s and 1990s, moved to a different metropolitan area just so that they could afford the more spacious housing where her grand piano—which the family had invested in at the advice of a teacher, and which represented the focus of the family's educational aspirations—could be accommodated.

Of course, there are easier, cheaper ways to get access to a piano. There are pianos parked in the corners of gymnasiums or community centers that a highly motivated or disciplined kid could gain permission to use after school to practice on. Usually, in the highly disciplinary environment of today's public schools, such access would be hard to gain, and janitors would chase out any child caught playing a school piano after hours. Home computers are smaller and more portable than pianos, but present similar obstacles to ownership based on family income. Procuring the device itself is the smallest—and in many ways the easiest—part of access provision, keeping up with the accelerating rate of planned obsolescence of computer products has nearly eradicated the benefit gained from falling hard-drive prices. In order for internet access to succeed, the device must be purchased in conjunction with a host of other peripherals, software, and a DSL line (currently making the total for basic cable or phone service plus high speed internet around $90 per month). Finally, there are ways that computers are difficult to maintain in the physical domestic space, despite their greater portability. Larger families result in more demand and therefore more fighting over the machine. The privacy on which much youth-oriented play with computers relies is harder to come by when there are fewer rooms and more people in them. Even the number of electrical outlets available in an apartment becomes an issue, as priority is usually given to media that is more easily shared—like television sets, game consoles, and DVD players.

Old pianos play much better than most hand-me-down computers function, and the job of setting up and maintaining outdated software can be truly daunting: "When old computers come without documentation, missing crucial cords to connect monitors to hard drives and hard drives to printers or keyboards, when the software is no longer available for sale, and no telephone assistance or other technical expert is available, attempting to make them work is often a pointless waste of dozens of hours of work."[5] While a used piano can still be a source of excitement for kids—a fun novelty—old computers are simply frustrating. Kids of all classes recognize an old computer when they see one. Surrounded by secondhand things in their daily lives, working-class children are experts at recognizing hand-me-downs, and resist using cast-off machines.[6] Planned obsolescence is the guiding principle of the new technology industries, and families are poorly situated to bear the costs of constant replacement and upgrading. Families who have not yet purchased a new computer with an internet connection do not appear likely to take on the added expense now, when over one third of families in Southern California must spend *more than half* of their income just to pay the rent.[7] The last census report underlines that gross disparities in income and home ownership follow racial lines. White incomes are two-thirds higher than blacks, and 40 percent higher than Hispanics. Seventy-five percent of whites own their homes, compared with only 46 percent of blacks and 48 percent of Hispanics.[8] New media was introduced into a world where the gap between the middle-class and poor families was very wide in terms of income and access to educational opportunity, and sadly, new technology has exacerbated

these gaps in the everyday lives of children. Huge numbers of kids go to class in schools that cannot afford new technology, and then come home to apartments where keeping the utilities turned on and possibly the TV uses up the budget long before the family could get around to saving for expensive computers, software, and DSL lines.

Being unable to afford the latest computer and fastest internet connection is especially hard on kids, because the very activities that inspire peer learning—teaching oneself HTML to put up a Web page or playing the latest computer games—are the ones that require the newest machines, the latest chip, and the fastest connections. If you want to develop digital literacy skills that are robust and confident, continually updated equipment is required. The largest gaps between rich and poor children are apparent in the arena of multimedia authorship: the very video, audio, and gaming applications that are most popular with children. "The economics of the information technology industry, together with the social stratification of educational systems, means that multimedia creation is highly *inaccessible* to the masses. On the one hand, while the cost of computers and Internet access continues to fall, the cost of the hardware, software, and bandwidth necessary to create the newest forms of multimedia will always be more expensive."[9] In other words, working-class children have little chance of enjoying the kind of computer and internet access that is residential and high speed, the kind that facilitates music downloading, online gaming, and instant messaging. And while these activities seem like nothing more than play, we know that they are vital to social inclusion. As education researcher Mark Warschauer points out: "What is at stake is not access to ICT [information and communication technologies] in the narrow sense of having a computer on the premises, but rather in a much wider sense of being able to use ICT for personally or socially meaningful ends."[10] For youth especially, because they are heavily targeted by marketers and are dependent on sites like MySpace or iTunes, the restrictions of the public lab or the outdated PC especially interfere with their desired uses for peer communication.

Some argue that the necessity for children to have a PC—and the costs for families—will soon be obviated by new technologies of ubiquitous computing. Will the obstacles based on lack of access to economic capital disappear with ubiquitous computing? In his book *Everyware*, Adam Greenfield posits the "vision of processing power so distributed throughout the environment that computers per se effectively disappear."[11] The promise is that household objects and things in the environment will allow "ordinary people finally get to benefit from the full power of information technology, without having to acquire the esoteric bodies of knowledge on which it depends." The question of sufficient economic capital to provide equitable access to all would surely disappear when "information dissolves into behavior."

Greenfield's book is a thoughtful inventory of the potential problems: especially regarding design, the time required for use—the "hassle" factor, problems relating to opting out, and privacy, that ubiquitous computing represents. It is not until his concluding chapter, however, that he considers the potential for ubiquitous computing to exacerbate class differences: "I see how readily the infrastructure that gets us these amenities also lends itself to repression, exclusion and the reinscription of class and other sorts of privilege." The issue that Greenfield does not enumerate is that the classes of "smart" goods that will hold the chips to deliver seamless computing will themselves be based on cost. Those that are hassle-free, durable, and fast will be the most expensive—whatever they are—and the cheap, the free, and the hand-me-downs will be more difficult to use and more time consuming in every way. Ubiquitous computing will function best in spaces never frequented by working-class families like hotel rooms, airplanes, stock brokerages, and so on.

This is the irony of media culture in all its forms: being the target upscale market can lead to the invasion of privacy, "the colonization of everyday life, and marketers [who] use children to cull valuable marketing information about parents from the children's Web activities." If you belong to the downscale market, you barely exist for the developers of cutting-edge technologies, whether you reside in New Delhi or Los Angeles. Children in the downscale market are subjected to a barrage of advertising for small ticket items on free Web sites. Kids gain free access to gaming or music sites by renting out their eyeballs for the viewing of ads, just like television viewing for those who cannot afford TiVo and premium channels. Smart technologies will not be targeted at households where English is not the first language, those with parents who do not qualify for major credit cards, or where the family does not reside in a prime zip code area equipped with digital cable lines. These are the same households where the largest concentrations of U.S. youth reside, as well as the most African-American and Latino children.

These downscale markets are left to the mass marketers of toys and junk food and popular music—firms that go after the kids' pocket money rather than their parents'. The growing importance of the internet has created a new disparity across class lines in the quality and quantity of access. While the mass market is targeted as consumers of junk food, publicity and promotional materials, and potential consumers of music and movies, the affluent children are targeted for "premium" content, cutting-edge hardware, subscription-based Web content and digital cable, educational software, and online courses.

Cultural Capital

Cultural capital consists of knowledge, tastes, and preferences: it is the totality of an individual's learning, both formal and informal. Bourdieu stressed that the means of acquisition of cultural capital can be as important as what is acquired, thus stressing the way that learning in all forms is tightly intertwined with the social circumstances in which it takes place, and the value of various knowledges, as accorded within and between specific social divisions. Bourdieu proposed the term "cultural capital," "to account for the fact that, after controlling for economic position and social origin, students from more cultured families not only have higher rates of academic success but exhibit different modes and patterns of cultural consumption and expression in a wide gamut of domains."[12]

There are similarities in the array of processes and literacies—the specific forms of cultural capital—involved in playing the piano and using a computer.

1 Learning is time consuming, with time spent practicing rewarded by qualitatively different levels of mastery. When large amounts of time "practicing" are invested, the computer user is rewarded by the achievement of a kind of automaticity of many levels of competence. This is similar to the way music learning requires a level of rote learning, practicing scales, and physical routinization—the pianist cannot read notes one at a time or visually search to finger each note on the piano. Similarly, if software programs (and games) are not mastered to a level where the interface, the shortcuts, and the keystrokes become second nature, the process is too cumbersome and tedious to expect children to even desire to use. There are striking similarities between the ability to waste time on computers and on music—learning early and having the free time to fool around are big advantages. Arriving at a deeper understanding of how hardware and software work—strong digital literacy skills—requires dozens of hours of trial and error. Video game play is just the most obvious example of this.

2 Practicing for large blocks of time results in a physical orientation to the piano or PC, so that the relationship of the body to the object becomes automatic rather than conscious. This is what Bourdieu would call "embodied" cultural capital. Music teachers obsessively teach, experiment with, and improve the student's posture, fingering, and stance. The greater physical ease with which users approach computers when they have their own machine, and have had hundreds of hours of practice, is obvious. For a child to sit at a computer or a piano for the requisite number of hours to achieve mastery requires an adaptation to the sedentary (and the solitary, when children use computers alone) behavior that can be very difficult for children who have been socialized to a more active, outdoor orientation of the physical (just as the piano or computer prodigy usually is not competitive in soccer, for example). In the middle-class home, parents nagging children to spend more time practicing the piano is commonplace; children need no nagging to spend time at the computer keyboard and parents may alternately worry about the unhealthiness of too much screen time, or conversely admire their children's cleverness in mastering digital technology.

3 Because of the requirement of free time and the desirability of achieving this physical ease, there is an advantage to learning at an early age. No one expects a person who began playing at the age of eighteen to become a professional classical musician. Many researchers have noted how quickly children can catch up on new technologies to their better equipped peers.[13] This catching up, however, requires unfettered access, and takes place more easily at home. Similarly, new research shows a correlation between early exposure to digital technologies at home and the widest array of technology use as adults—there is no correlation between exposure to digital technologies at school and later use.[14]

4 Mastery requires learning a symbolic language, with conventional patterns of logic and sequencing and some mathematical skills. A small percentage of musicians master these intuitively (playing by ear) and innovate in profound ways that later may be conferred with status—I'm thinking of jazz. Most fans of music do not understand music theory or composition, just as most computer users do not understand programming. But knowledge at this advanced level is required for paid work, that is, to convert what might have been learned in one's spare time, partially through leisure pursuits, such as gaming.

Beyond these requirements, there is uncertainty about what is deemed worthwhile—and in which social realms that judgment holds—in the musical and the digital realms. There is some instability in the system of distinctions, a problem exacerbated by the association of both music and digital media with youth. Certain musical tastes (pop) are much less distinguished than others (baroque music), but the system of distinctions is situated within a field, so that a knowledge of pop music might be valuable in film or television editing, for example, although not helpful for getting into Julliard. Bourdieu analyzed the complicated situation of risk when investing in cultural forms—what he termed "middle ground" arts—that are newer, and less legitimate:

> Arts such as cinema, jazz and even more, strip cartoons, science fiction or detective stories are predisposed to attract the investments either of those who have entirely succeeded in converting their cultural capital into educational capital or those who, not having acquired legitimate culture in the legitimate manner (i.e., through early familiarization), maintain an uneasy relationship with it. . . . These arts, not yet fully legitimate, which are disdained or neglected by the big holders of educational capital, offer a refuge and a revenge to those who, by appropriating them, secure the best return on their cultural capital

(especially if it is not fully recognized scholastically) while at the same time taking credit for contesting the established hierarchy of legitimacies and profits.[15]

Digital media culture is associated with many of these middle-ground arts, from video gaming, to popular music, to advertising. They appeal to kids as new and cutting-edge, and promise an appealing shortcut to success that bypasses traditional academic and cultural hierarchies. This lack of certainty over what is worthwhile is endemic in the digital realm because of its relative newness. Nowhere is this more apparent than in the field of gaming, where skill at gaming is common and admired within fields of both a digital elite and a working-class youth culture. Gaming employs a wide variety of skills, most of which, when seen objectively, seem to be at least as good for children's cognitive development as music lessons. Consider David Buckingham's description of the variety of skills involved in playing a computer game.

. . . an extensive series of cognitive processes: remembering, hypothesis testing, predicting and strategic planning. Game playing is a "multiliterate" activity: it involves interpreting complex three-dimensional visual environments, reading both on-screen and off screen texts (such as games magazines) and processing auditory information. In the world of computer games, success ultimately derives from the disciplined and committed acquisition of skills and knowledge.[16]

Researchers have noted a wide array of cognitive abilities that are facilitated by video and computer game playing, and anecdotal evidence suggests that high achievers in computer science and programming are also often avid gamers.[17] As I will discuss below, through an example of two students at High Tech High, their interest in gaming is not sufficient to either enable broader academic success or learn how to program. Bourdieu's value in thinking about digital literacy skills comes from the recognition of the arbitrariness of systems of distinction, and the ways that some skills—however indicative of intelligence and mastery—never convert into economic gain at a predictable rate. The PlayStation 3 may be equipped with Linux, but this does not mean that owning and playing one grants any advantage in the educational system of distinctions, or that the capacity to program will be used by avid players. Being one of the first to own the latest PlayStation platform might make one highly recognized within a subculture of one's peers, or being an early innovator using Linux on the PlayStation 3 might grant one acclaim in the online communities devoted to discussing video game hardware and software, and user-generated content. However, converting these into a form of cultural capital with sufficient value to get one a job is an uncertain endeavor. Even the newest forms of cultural capital may require other kinds of material support—economic and social capital, as Bourdieu calls them—to convert them into a paying job. Cultural capital works best when it is tied to the kinds of social networks provided through family members who are themselves employed in the culture industries, or the mentoring or cohort groups that prestigious universities provide.

One of the biggest differences between music and computers as they are used for the internet, social networking, and word processing, is that computer learning—even in its more casual forms that do not involve programming, for example—requires a high level of verbal literacy. In many ways, computers have made literacy and the ability to manipulate linguistic codes more important than ever before. The use of the internet, for example, requires a higher level of reading skill than textbooks, and children need a great deal of explicit instruction in how to evaluate information. Schofield and Davidson's five-year research project on the introduction of the internet into elementary, middle-school, and high-school classrooms in a large urban school district elucidates the many complexities of introducing new media

in a school setting: educational benefits do not flow automatically from internet access. Attitudes and expectations, technical knowledge, classroom culture and internet culture, and curriculum design, implementation, and follow-through all affect what teachers and students can accomplish with the internet. When students often possess quite different levels of literacy—technical and language-based—the downside of opening up access to the internet was that students easily wandered off-topic to entertainment sites, and that in the context of a busy computer lab it is impossible for teachers to monitor Web browsing.[18] In many ways, the better your reading skills, the less likely you are to be distracted by ads, games, and multimedia pyrotechnics. While the internet offers a vast resource for student research, it has disadvantages over the traditional children's library:

> Information overload may be the biggest problem for younger students. Unlike library resources, the material found on the Web has not been prepared with students' level of background knowledge and reading ability in mind. . . . Even students with advanced reading skills sometimes found it difficult to sift through the masses of information they acquired about a topic of interest to select accurate and pertinent information. This in turn meant that teachers often needed to work very closely with students as they used the Internet, particularly at the earlier grade levels.[19]

Most schools have separated computer lab time to highly regulated, disciplined, project-based work. Better suited to digital learning than traditional classrooms are situations that rely on peer learning, scaffolding, and unrestricted time. However, these classroom practices are at odds with the school reform emphasis on increased discipline, narrow focus on curricular standards, and "accountability" through standardized testing measures. This is one reason why after-school programs have been more successful in teaching digital media than regular classrooms.[20] The hours of trial-and-error that many digital skills require and the freedom to develop a deep understanding of software that includes programming are nearly impossible to practice in a public school computer lab. This fact is what gives young people with high-end connections and the newest computers at home a massive advantage over those limited to school or public lab use.

Thus, we return to the advantage of domestic access. Students with this advantage become bored and restless in classrooms where their peers are behind and their skills may even exceed those of the teacher. Classroom instruction is poorly suited to bridging that gap. In Bourdieu's formulation, the means of acquisition of cultural capital are significant and have lasting effects. Early learning, especially learning "that takes place without any express intention to teach" as happens with children whose parents already work on computers, is the most effective and the most distinctive form of cultural capital. The cultural capital of digital literacy reflects its origin in the middle-class home, taking its place alongside other forms of cultural capital, such as knowledge of music and art:

> The "inimitable character" of the bourgeois relation to culture derives from the fact that they are acquired, pre-verbally, by early immersion in a world of cultivated people, practices, and objects. When the child grows up in a household in which music is not only listened to but also performed, and a fortiori when the child is introduced at an early age to a "noble" instrument—especially the piano—the effect is at least to produce a more familiar relationship to music, which differs from the always somewhat distant, contemplative and often verbose relation of those who have come to music through concerts or even only through records . . . (the system of distinction) only recognizes as legitimate the relation to culture (or language) which least bears the visible marks of its genesis, which has nothing "academic, scholastic bookish, affected or studied about it, but manifests by its ease and naturalness that true culture is nature—a new mystery of immaculate conception."[21]

There is a presumption that youth now have universal access to computers—even if they do not own one, they can use one at school or at the library. But the likelihood of gaining strong digital literacy skills on this type of machine is much slimmer than on a home computer. In other words, learning to use computers at school is like the music education class in which you have forty minutes to hold an instrument in your hands once a week, along with thirty other kids. The chances of success are not even remotely comparable to the experience of a kid who learns to play on his or her own instrument, at home, with lessons from a private instructor. Just as the music education teacher traveling from one public school to the next has probably pared down his or her skills to the minimum requirements of knowing what each instrument looks like, how it works, and which group of orchestral instruments it belongs to, the student at the public computer lab is at best likely to come away with only the most basic—the weakest version—of digital literacy skills: an ability to manipulate the keyboard, the mouse, Web browsers, graphics programs, and word processing programs. Learning programming, and how to write software as opposed to just using it, is much more difficult at the public computer lab.

The recognition of these distinctions among forms of digital literacy determines the convertibility of digital skills into social prestige or earning capacity. The speed of acquisition is an aspect of cultural capital that is blatantly more prominent in digital literacy than in musical literacy. The canon of classical music is relatively unchanging (although composers and styles of performance go in and out of fashion)—piano training has a longer market value than digital skills. In the digital realm "early adoption" is key: getting there first, learning to use a new piece of software or equipment is extremely important for its relative value.

Andrew Ross notes the way that the youngest job candidates replace more mature workers in the new media firms he studied:

> For those who had spent years in the trenches learning Web skills, it was a ceaseless struggle to stay ahead of software upgrades that threatened to render these skills obsolete. The Web developer's trade was increasingly standardized, as the industry developed programs and idioms to accomplish Internet work with the same degree of efficiency as in the software development sector. Throughout history, elder artisans had possessed the fullest knowledge of the trade, and they passed it on to youthful apprentices. In the modern technology industries, this order no longer applied. The newest recruits were often the most skilled because they were up to date on the latest technologies.[22]

The treadmill of computer upgrades and self-learning has increased rapidly, as some skills have been more widely disseminated.

For those playing catch-up in digital media skills, the outlook is discouraging. In a correlation of home computing with employment, gender, and education, a recent study found that:

> Women or the poorly educated have increased their computer and Internet access. However, in many cases, men, the well-educated labor force participants, have increased access and use even more; thus many digital gaps remain or grow.[23]

The 2006 Pew Internet and American Life study reported on the closure of the digital divide based on the survey data that the numbers of blacks and Latinos who use the internet have steadily risen. The numbers who have a home computer still show a large disparity, however, with less than 50 percent of blacks and Latinos having internet access at home. Spanish speakers are excluded from the study, a group that comprises over 40 percent of the U.S. Latino population. For households earning less than $30,000 annually, only 21 percent

are online. According to a 2006 Pew study, high-speed internet connections—which strongly correlate with users who ever post material in the internet—are found in only 31 percent of African-American households. Broadband access is strongly correlated with education: 62 percent of households where an adult has completed college have access as opposed to 17 percent of those without high-school diplomas.[24] Andy Carvin warns that while progress is being made in terms of the racial digital divide, income and education remain enormous roadblocks.[25] As Stanley Aronowitz warns, "Despite the well-publicized claim that anyone can escape their condition of social and economic birth—a claim reproduced by schools and the media with numbing regularity—most working-class students, many of whom have some college credits but do not graduate—end up in low- and middle-level service jobs that do not pay a decent working-class wage."[26] A lack of economic capital reinforces the lack of higher status cultural capital. The determining role of social networks in digital communications exacerbates these divisions even further.

Social Capital

Social capital consists of networks, connections, group memberships, and familial relationships: Bourdieu defined social capital as "the sum of the resources, actual or virtual, that accrue to an individual or a group by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintance and recognition."[27] One of the most significant aspects of digital communication has been its provision of new forms of social networking—a democratization of access to social capital, unfettered by the restrictions of physical space and geography. Although technological determinists championed these networks as more open than previous forms of networking, such as church membership, school attendance, or country clubs, there are ways that digital networks might increase both class cohesion and the exclusion of those poorer or less educated.

To return briefly to the example of music: How does social capital increase the chances of becoming a concert pianist or securing a job on a symphony orchestra? Musical talent does not lead directly to recognition, awards, or employment. The private music teacher, one who is also a distinguished performer, is required for success. Usually, a student moves up a network of progressively more expensive and prestigious teachers, each with a wider set of professional connections. Social capital is gained by circulating through a series of teachers, and these teachers lead to other coaches, knowledge of summer institutes or prestigious camps, competitions, and so on. A hierarchical system of connections is required in order for the musician to display what has been learned and cash in on it, as it were. To be a child prodigy—or rather to be recognized as a child prodigy—for example, means proceeding through an elaborate institution for recognizing and credentialing musical talent. Social capital and the networks it makes available are the keys to accessing this system. Attendance at one of a handful of elite conservatories in the United States is another.

The digital realm appears to be more open to larger numbers of participants than the field of classical music. However, the maintenance of strong digital literacy skills relies upon social networks of people who have knowledge of computers and can provide assistance, and a level of literacy that will provide the ability to type, read manuals, use e-mail fluently and benefit from written exchanges online. There is a "multiplying factor for social inclusion" of the groups who successfully gain access. Warschauer has emphasized that the necessary resources—physical (the box), digital (the connection), human (literacy), and social (friends and family members who are also online)—for Internet access are "iterative," mutually

reinforcing. Networking online requires as a basis the capacity to know others with at least the minimal amounts of economic and cultural capital necessary to participate in digital communications.[28]

Yet the internet, once thought to hugely facilitate social networks, is rapidly becoming more exclusive. Consider the trend toward exclusivity represented by the progression from AOL chat rooms to password-protected Web sites, from the first online computer games to the elite World of Warcraft guild. As Geert Lovink comments:

> The response to massification and regulation is the creation of an invisible cyber elite. . . . As a response, business and developer groups, as well as activists and researchers, have started mailing lists and discussion forums within password protected sites. Who wants to discuss sophisticated concepts with all the booboos and weirdos who are surfing the Web, looking for places to make trouble? Are you able to keep up with hundreds of e-mail messages in your inbox every day? I do not like you, and your silly opinions, so why waste precious time on opinions and attitudes one detests?[29]

One crucial flaw in the claims about the greater democracy of online communications is that it ignores the operation of social distinctions. One of Bourdieu's important contributions was to conceive that participation in culture is a dynamic system in which jockeying for position was always at play. One of the most important forms of distancing applies to digital culture: "The higher classes . . . observing the cultural style of the classes below them, engage in reflexive role distancing, once again re-establishing their superiority to those who have a less sophisticated view of cultural symbols."[30] Youth are not impervious to status distinctions—in fact, adolescents may be more status conscious than other age groups—hence the movement from Xanga to Live Journal to MySpace to Facebook.

Young people famously use digital communications—instant messaging, cell phone texting, and social networking Web sites—to maintain their social capital, at least with those peers who can afford to keep up with the costly requirements of these technologies. However, there is nothing inherently democratic about the young and the wired. Facebook illustrates the ways that youth can be strongly invested in keeping social networks exclusive. Facebook also exemplifies the continued importance of socioeconomic and geographic location as determinants of access to social networks. In its initial version, Facebook allowed students enrolled at Harvard to participate in a network of online communications. Soon it expanded to other major universities: participants could gain access to all other members at their university by providing proof of enrollment in the form of a registered e-mail account at their university. Facebook has been wildly successful and its use among students is rapidly expanding beyond dating, parties, clubs, and classmates to launching small businesses, advertising one's career, and networking with other alumni. According to the founder, the success of Facebook is based on the fact that people are willing to divulge more and more personal and interesting information about themselves when they are certain that it will be viewed by only a limited network of people.[31] From a commercial point of view, the greater valuation of Facebook than MySpace derives from the greater exclusivity of its network, the frequency of log-ins and time spent on the site, and the potential to gain access to the especially desirable market of young people attending college. Users started to complain when Facebook expanded to state colleges, community colleges, and high schools. The dilution of the site's exclusivity threatens the value of the social network.

Social capital is crucial to the convertibility of cultural capital into employment—for youth with digital skills, the school-to-work transition is as much about connections as it is about talent or ability. The lack of social capital screens out working-class youth from employment

in the highest income and most challenging jobs in the digital realm. Their lack of economic capital bars them from the assumption of risk that the new media industries have foisted on employees by promising stock options and the hope of vast financial rewards. Yet these are the kinds of jobs youth dream of—and are encouraged to dream of—at every charter school across the country that specializes in digital media. Good jobs in new media are jobs for the young, the well connected, and those with enough family capital to float them through lengthy education, and long periods of employment-seeking in expensive housing markets. At the trendy new media firm Razorfish that Andrew Ross studied, a personnel officer explained that "diversity usually means race and gender, it rarely means age, background or class. Everyone here has a similar educational background."[32]

New media jobs are prime examples of the ways that the intersection of economic, cultural, and social capital function according to some new rules and demands in the new economy. Gina Neff defines this work as entrepreneurial labor in her study of workers in Silicon Alley in New York: these cool jobs are especially attractive to the young. What is required to pursue "entrepreneurial labor" is an acceptance of much higher risk than other industries and a greater personal responsibility for one's career through constant self-training and social networking. In his interviews with hundreds of workers in the new media industries, Andrew Ross noted that even in the progressive, humane workplaces "advances in corporate democracy could turn into trapdoors that opened onto bottomless seventy-hour-plus workweeks."[33] Besides extended periods of unemployment, this also entails the acceptance of jobs with no benefits, long hours, part-time work, and short-term contracts. As educators, it is important to think through and to talk about with young people the realities of these forms of creative work.

> Because cultural work is prominently featured in popular discourse, especially in visual images, and associated with trendsetters, beautiful people, hipness and cool, this problematic normalization of risk serves as a model for how workers in other industries should also behave under flexible employment conditions . . . without strong stabilizing norms and regulations of workplace behavior and rewards, media workers develop entrepreneurial labor in the dual hope that they will be better able to navigate uncertainty and maintain their association with a "hot" industry—even when that industry is marked by a "winner take all" inequity in both income and status.[34]

The significance of social capital exhibits itself in the tendency of new media workers to incessantly network. Entry into the profession is often based on implicit rules of the culture—norms that are imparted through the experience of attending elite universities, and often mirror the kinds of social relations of the Ivy League students on Facebook. Thus, a new industry and a new form of social networking reproduce the old class advantages of a predigital generation.

Digital media teachers and policy makers must recognize how the dream of success in industries of gaming, design, and digital media production is often unrealistic. In fact, the rapid spread of digital media as communication technologies and a source of leisure among youth has encouraged legions of students (and often their parents) to dream of escaping the dull grind for a cool job. The dream of working in music, advertising, design, or gaming of all kinds has now been disseminated on a vast scale. As Aneesh reminds us:

> The idea of treating computer-mediated labor as mostly design-oriented work also suffers from the problem of exaggerating what is still a tiny part of IT work. . . . The majority of IT labor still consists of some sort of data entry and data manipulation work, including the work performed by bank tellers, accountants, secretaries, and all others who serve at the front and back ends of state and corporate bureaucracies.[35]

The type of employment using a computer that is likely to be familiar to the vast majority of people, then, is a kind of work where keystrokes might be counted, where supervisors may listen in on phone calls uninterrupted, where productivity is scrutinized on a daily and hourly basis, and where conversation with coworkers is forbidden.[36] The stressful and unpleasant circumstances under which this kind of work is performed helps explain why blue- and pink-collar adults might feel more alienated from computer technology and tend to stay away from it during their leisure time.

Working-class students are more likely to have parents employed in jobs that do not use a computer, or in jobs requiring the more alienating forms of computer work, or they are likely to perceive the impossibility of succeeding in the field of computers. This is related to the fact that there can be penalties—in the form of a loss of social capital—when working-class students devote effort to acquiring cultural capital related to computers. It is the penalty of being a nerd, a geek, a kid too identified with school and teachers. Social class, ethnicity, and language interact with gender expectations in determining who likes to use computers. Computer affinity develops out of one's school experience, access to computers, and social networks of friends and kin. John Hall reminds us that cultural capital does not have the same currency everywhere it circulates:

> . . . cultural distinctions do not represent some generalized currency of "legal tender" among all individuals and status groups. . . . Cultural capital, after all, is good only (if at all) in social worlds where a person lives and acts, and the value that it has depends on sometimes ephemeral distinctions of currency in those particular social worlds.[37]

Urban working-class children and children of color may reject computers for the values they represent (such as dehumanization) and denigrate digital media for its emphasis on written rather than oral culture, their associations with white male culture (hackers and hobbyists), and their solitary, antisocial nature.

Failure to recognize the way social networks are defined and constituted through relations of economic and cultural capital is the logical flaw in the work of many new media theorists. Benkler's *The Wealth of Networks* is a recent example of this blind spot. In the following passage, Benkler moves rapidly from an acknowledgment that digital networks reproduce older social determinants, to an invocation of the fabulous potential for these networks to create new forms of capital:

> We merely need to see that the material conditions of production in the networked information economy have changed in ways that increase the relative salience of social sharing and exchange as a modality of economic production. That is, behaviors and motivation patterns familiar to us from social relations generally continue to cohere in their own patterns. What has changed is that now these patterns of behavior have become effective beyond the domains of building social relations of mutual interest and fulfilling our emotional and psychological needs of companionship and mutual recognition. They have come to play a substantial role as modes of motivating, informing, and organizing productive behavior at the very core of the information economy.[38]

Benkler allows that internet tools "are skewed in favor of those who are already well-off in society," but skips over the digital divide because public access is increasing, and because computer skills are far and away more widely distributed than the tools of mass-media production. Instead of the thorny problem of inequality and entrenched disparities in wealth and access, Benkler turns to psychological terms and a discussion of the extrinsic and intrinsic motivations of individual behavior. The focus on motivation erases the social and material constraints that cause inequality, reducing them instead to personality and individual

choice. For Benkler, the problems of inequity have been magically solved by the limitless opportunities offered by technology: "The majority of individuals in these societies have the threshold level of material capacity required to explore the information environment they occupy, to take from it, and to make their own contributions to it."[39] This divides society into good productive people, on the one hand, and those who "choose" not to engage, on the other. In the happy world of networks, all that remains is different tastes for types of rewards.

> Clearly, some people are more focused on making money, and others are more generous; some more driven by social standing and esteem, others by a psychological sense of well being. The for-profit and nonprofit systems probably draw people with different tastes for these desiderata. Academic science and commercial science also probably draw scientists with similar training but different tastes for types of rewards. . . . We spend some of our time making money, some of our time enjoying it hedonically; some of our time being with and helping family friends, and neighbors; some of our time creatively expressing ourselves, exploring who we are and what we would like to become. Some of us, because of economic conditions we occupy, or because of our tastes, spend very large amounts of time trying to make money—whether to become rich or, more commonly, just to make ends meet. Others spend more time volunteering, chatting, or writing.

Social differences, then, have dissolved, substituted by the great "we" who engage in digital networks. We need Bourdieu to correct the idea that digital networks are free and unfettered, that everyone has already reached the threshold of participation that, as Benkler idealistically puts it, "Information is nonrivalrous (we can both use it at the same time)." Benkler's model only works in a world where the playing field is level for participation in digital networks. The latest Pew study showed that only 31 percent of internet users posted material on the internet (from home or work)—presumably the first step in the kind of participation that Benkler is talking about. Users are strongly determined by whether they can afford the most expensive kinds of access: of those who post online content (blogs, Web pages, etc.), 71 percent have a domestic broadband connection.[40]

When these barriers are ignored, new media theory simply reiterates ideology and reifies social inequity, turning gross discrepancies in access to economic, cultural, and social capital into differences of proclivity, as Benkler does. Some of us just happen to "spend more time volunteering, chatting, or writing." It is just a question of motivation, of psychology, of human nature, as Bourdieu explains: like all the ideological strategies generated in the everyday class struggle, it *naturalizes* real differences, converting differences in the mode of acquisition of culture into differences of nature.[41] Rather than interrogating the persistence of the technology divide—especially the home technology divide—Benkler counts on digital technology itself to solve the problem: "While the digital divide critique can therefore temper our enthusiasm for how radical the change represented by the networked information economy may be in terms of democracy, the networked information economy is itself an avenue for alleviating maldistribution."[42] Benkler's model considers the difference as a matter of individual will and attributes to technology itself the agency for change. The example of High Tech High demonstrates some of the pitfalls of this model when applied to education.

High Tech High

San Diego's High Tech High opened in 2000, graduating its first four-year class of 105 students in 2004, with Larry Rosenstock, a former attorney, as its CEO and principal. The school is equipped with a great deal of expensive technology, donated by its founders, and in

some ways tested for future school markets. The curriculum is project based, with students enrolling in fewer courses, dedicating a substantial portion of the school day to teamwork on these projects. Coursework is typically conceptualized in terms of multimedia projects. Final examinations focused on the review of the students' digital portfolios. Student work is available in a digital portfolio accessible to the public through their Web site. As one journalist enthusiastically described the school: "High Tech High students learn through a hands-on approach that encourages them to pursue projects of interest to them. Classrooms look like high-tech workplaces, and students have frequent interactions with career professionals through internships, projects, and other activities."[43]

The charge for High Tech High was to supply for Irwin Jacobs the 800 engineers he needed for the annual expansion of the wireless company Qualcomm. Jacobs frequently complained that students were lacking in math and science training, and that they had poor communication skills—he needed engineers who could read and write. His charge to Rosenstock for High Tech High was for small enrollments and school size, and an emphasis on technology. Forbes magazine's admiring portrait of Rosensock describes him in terms like, a "frustrated soul" who "outsmarted the bureaucrats," by getting around the teachers' union and school district regulations. Rosenstock's philosophy is that "if you treat kids like adults, even the most bruised and battered will play up to the role." High Tech High School provides an important case study of corporate and business interests influencing education, and how a lack of social capital can prevent students from cashing in on the skills and training they have.[44]

Kenny and Lucas are two boys who joined the freshman class of 2004 at High Tech High. Kenny is the only son of parents who both held Masters' degrees from the University of California. They could not afford to own their own home, but they had white-collar jobs and used computers at home and at work. Kenny was extremely keen on video games, but also ambitious enough to want a job in game design. Kenny was a childhood and family friend of Lucas. Lucas's parents had BA degrees, but they were divorced and their attention was divided among multiple kids. Lucas went to High Tech High as his last hope of fitting in at school, as he had a history of dyslexia and a flagging interest in formal education.

How did these two boys fare at High Tech High? Both boys were excited by the laptop computers, the multimedia access, and the curricular style of unstructured afternoons and group projects, but Lucas accomplished little on his digital portfolio projects, which comprised the majority of his grade, and nearly failed. He dreamed throughout high school of being a video game tester. This was his number one ambition in the world of technology, and his interests never expanded beyond forms of gaming (including card-based role playing games). He never learned programming at HTH, and the unconventional structure meant that he learned little math or English, either. With no family members using computers at work or employed in traditional white-collar jobs, the project-based curriculum left Lucas far behind. His parents, who were not computer literate themselves, were less able than they had been when Lucas attended a traditional school to monitor his progress on the digital portfolios, and mistook his long hours spent "practicing" on the computer in the afternoons as a sign of his success. They were repeatedly surprised by Lucas's failing midterm and final progress reports.

After barely gaining the units to graduate, Lucas took a job as a magician for conventions and parties. Nothing he learned at High Tech High was put to use here. Lucas had no interest in attending any college. His experience at High Tech High never extended his ambitions beyond being a video game tester, and when the access to technology was restricted, Lucas

turned to playing the role playing card game Dungeons and Dragons. For Lucas, the High Tech High pedagogy, with its long-term deadlines, free afternoons for project work, and fewer classes, allowed him to optimize his play with new technologies and his interest in gaming, but Lucas was not an outstandingly clever or quick gamer (not that the career plan of being a game tester was realistic for any of the High Tech High students), nor was he curious enough to explore the programming behind the games. The curriculum's value of technical skills over traditional English skills did little for Lucas's lagging verbal communication skills—he did not learn to type or spell, and avoided written communication—preferring to remain in the live, peer-driven Dungeons and Dragons group.

Kenny found the opportunity to fuel his interest in gaming a temptation at High Tech High, but earned good grades and kept up with his work. Kenny was interested in manipulating technology and found the school to be a place where he could experiment with good technology. Kenny's driving interest was in video gaming, however, and it often distracted him from his schoolwork. When it came time to apply for college, however, he was rejected from all the University of California campuses—he was not competitive in standardized testing with students from a traditional curriculum. Kenny attended the local community college and would transfer later to a four-year college. His parents were monitoring the situation carefully, having been dismayed by his college rejections. Both Kenny and Lucas enjoyed the privilege of going to a high school they liked, even if the results were less than encouraging. The access to high technology did not prove to be the magic bullet for learning and motivation—in some ways it was a distraction for both Kenny and Lucas, who were unable to convert their Web site making skills, honed through all those digital portfolios, into a job or a premium college admission. High Tech High has since moved to more structured coursework and abandoned the free afternoons for project work. While the school regularly and enthusiastically offers tours, it does not open its doors to outside researchers. Rosenstock keeps a very tight rein on the kind of information about the school that becomes publicly available, and its image in the press is carefully crafted, from vivid portraits of kids lifted from dysfunctional homes to MIT admissions. All press coverage of the school quotes the statistics that all of its graduates attend college—a carefully spun piece of public relations.

Expensive charter schools on the model of High Tech High increase equity problems in a school district. While the initial emphasis was on working-class and minority youth in admissions, by 2006, only 15 percent of the students enrolled in High Tech High qualified for federal free lunches. Admissions are reportedly based on proportional rates based on county zip code—if this were restricted to city zip codes, the student body would undoubtedly be of a lower income, given the predominance of wealthy suburbs and sky-high real estate prices in San Diego County. This higher rate of middle-class children attending the charter suggests several things about schools and family social networks. They also attract those parents with the most cultural capital, who are likely to be the most active participants in fundraising, and volunteer time, thus depleting the support resources for traditional schools. The application process for charters like High Tech High constitutes an enormous barrier for working-class families. The amount of writing places most non-English speaking families beyond the applicant pool already. Knowing how and when a child needs to get on the waiting list alone requires diligent research and a strong social network. It takes parents with a certain level and kind of cultural capital to worry enough to put an infant on a waiting list for a charter high school. It also takes a rare kind of job stability to predict the family's whereabouts a dozen years ahead. A charter like High Tech High is difficult to reach by public

transportation, offers no bus service, requires waking early, and returning home late (thus precluding the student from caring for siblings or helping with dinner or housework after school). Social capital in the form of networks, reinforced by de facto income segregation in housing markets, become urgently important for carpooling to school. Charter schools thus attract and concentrate those parents with the most cultural capital at the smallest schools. These parents are the most active participants in fundraising, and volunteer work ranging from the administrative (school site councils, budgetary oversight panels, and school boards) to the educational (computer help, reading, and math tutoring), thus depleting the support resources for traditional schools. While parents can hardly be blamed for deserting traditional schools—especially when their worst fears about drugs, violence, and educational achievement are continually reinforced in the press—the effect has been to create, within publicly funded schools, an elite stratum that resembles the privileges formerly reserved for those who can afford the (now exorbitant) tuitions of elite private schools.

Educational inequality in a state or school district worsens when high profile, well-publicized, and expensive experiments in education like High Tech High attract vast amounts of grant money, reducing the pool for neighborhood schools and school districts. High Tech High was rewarded in 2003 with enormous grants from the Gates Foundation that were designed to enable Rosenstock himself to choose ten schools to recreate the High Tech High paradigm. A commitment of $7 million has been made by the Gates Foundation and other corporate philanthropies to extend the High Tech High model to other U.S. cities.

What dangers does the High Tech High model, where large investments from high tech firms commit start-up money to charters, pose for students and local schools? The High Tech High model suggests that the solution to school problems will be corporate driven, and that the solution will be turning out students with skills and work habits suitable to the new digital economies. This reinforces the notion that the appropriate work of schools and teachers is to focus on fixing problems with the economy and the labor market, and to facilitate the transition to digital–knowledge-based forms of production. Biddle and Berliner trace these ideas to the nineteenth century, while usefully reminding us of their popularization in the 1950s with the "Human Capital" trend in educational reform, which emphasized thinking about students as human resources, and investing in education to the extent that it would "benefit industry and fuel the national economy. In early years this argument had been seized by canny industrialists, who realized they could reduce costs if the public schools could only be persuaded to provide the specialized training their firms would otherwise have to fund in apprenticeship programs."[45] Worries about the ability of the United States to compete in the global economy, and calls to prepare students for work in some kind of new—and typically vague—forms of employment were not born with the internet. Before the Gates Foundation got into the business of reforming U.S. public schools, Ross Perot, having made a fortune in computers, did the same in the state of Texas, with a host of negative, unintended consequences.[46] The idea that having made a fortune in high technology is the right credential for dictating educational policy, or that highly successful entrepreneurs are more thoughtful and perspicacious about schools than other leaders in society, needs to be rigorously challenged. Indeed, one of the modifications to Bourdieu's theories that must be made when using his work in the United States regarding cultural legitimacy, as sociologists Michele Lamont and Annette Lareau (1988) have explained, is that purchasable, rather than culturally acquired, symbols of legitimate culture have been more acceptable than in Western Europe and granted more weight.[47] There has also been a deeply held regard for technically oriented knowledge and for material accumulation, allowing

those with less command of Western humanism, for example, to be held in the highest esteem.

Charter schools, especially those with the kind of profile of High Tech High, are less accountable to their local communities than neighborhood schools. This is true of all magnet schools to some extent, but it is especially true of high-profile schools driven by corporate philanthropists. Such schools depend on successful public relations efforts to make their achievements seem vastly superior to the efforts of teachers in traditional public schools. A constant stream of celebrities and politicians visit High Tech High, while serious researchers are kept out; instead, private educational consulting firms do the work of evaluation. Under these circumstances, it is easy to hide the failure of High Tech High for a student such as Lucas. How is a neighborhood school to compete with these combined advantages? Dozens of newspaper and magazine articles each year—written by journalists directly from press releases—parrot the successes of Gates Foundation educational experiments. Yet some evidence is accumulating (more systematic than my anecdotal cases of Lucas and Kenny, and their invisibility in the statistics about college success churned out by High Tech High) that challenges the wisdom of the Gates Foundation pedagogical strategies. In 2005, a study by SRI International and the American Institutes for Research (commissioned by the head of the Gates Foundation) found that, compared to traditional schools in the same school district, the Gates-funded schools had better attendance, more "welcoming" atmospheres, and harder reading and writing assignments than traditional schools. It is test scores on which traditional schools are crucified, however, and on these measures they did no better or even worse than traditional schools:

> English and reading were only slightly improved, with 35% of the small schools' students doing moderate-quality work or better, compared with 33% at large high schools. The small-school goal of engaging students in projects that combined math with other subjects produced poor results because rigorous math instruction often got short shrift. Only 16% of students at Gates schools made the grade in math, vs. 27% at traditional schools.[48]

If these high profile philanthropic experiments in public education fail, the new breed of educational "CEOs" (as the principals of such endeavors are called) do not hesitate to close down the operation. The head of the New Visions project in New York—a Gates Foundation project—is described admiringly by Business Week. Yet the power of Gates Foundation money paved the way for an extraordinary new state law, enabling key charter school corporations, like Rosenstock's High, to completely bypass local school board approval for building ten more charter high schools in the state. The state law, Assembly Bill 1994, created an "alternative authorizer" process allowing the State Board to directly approve and oversee charters without intervention of the local school district.[49] A new San Diego venture capital firm, Revolution Community Ventures, is working on a for-profit basis to secure tax credits for the new charter schools.[50] The founder is working closely with Rosenstock, having moved from the high tech venture capital business to the charter school tax credit business. The granting of this exceptional opportunity to Rosenstock's chain of charter schools widens the San Diego precedent of hiring nonunion teachers and forgoing union rules for teacher training to the state as a whole. It removes the thorny issue of local accountability and local politics from the educational equation. Qualcomm and Microsoft, as represented by the philanthropies of Irwin Jacobs and Bill Gates, have bought their way into unprecedented, direct influence on matters of public schooling that have historically been the province of teachers, local communities, local elected officials, and families. They have paved the way

for the deregulation of public schools and for public funding of what would have formerly been considered the kind of exceptions only available in private schools. They have rewritten the curriculum to place technology and the favored management techniques of their own firms at the center. They have installed their own school administrators and teachers, and they have done so without any long-term commitment of funds to sustain these very expensive—and untested—experiments in education.

Private philanthropy is obviously no substitute for public funding and support for schools. After these multimillion dollar grants have expired, the school is charged with the task of finding some other means of support. Foundations give the money and run. In their wake, they leave a precedent for subverting teacher union rules and lowering job security for teachers.[51] The erosion of teachers' rights threatens the very demographic group the Gates Foundation claims to serve, because public school teaching has historically been one of the primary avenues for working-class, African-American, and Latino students to gain a living wage, benefits, and a foothold in the middle class. Historically, employment as a unionized schoolteacher is a far more likely point of entry to the middle class than employment in high tech industries. Devaluing the work of teachers, by conferring on outside experts the right to decide what is best for specific communities of students, and favoring technological solutions to pedagogy, fundamentally marginalizes women, who have been and continue to be the majority of public school teachers.

Philanthropies are ruthless and fickle as funders of public schools. The results are always disappointing compared to the corporate world. After the money is gone, the tab must be picked up by local and state institutions, or by federal grants. After the funding is gone, the damage in public support for traditional schools remains: High Tech High stacks the deck for better outcomes on measures such as college attendance against neighborhood high schools and then blames the school district. Every exaggerated press release about the handful of success stories (such as MIT admission) from High Tech High, at the same time constitute a condemnation of the local schools that do not benefit from the extravagant budgets the philanthropists provide, and further evidence for technology as a cure-all for educational problems.

To return to the piano analogy, we might consider the spread of the piano in eighteenth century Europe when there was a widespread, rapid adoption of the instrument and a consequent growth in the production of pianos and the writing of piano music. In sociologist Max Weber's 1921 essay, "The History of the Piano," he traces the development of the piano from other keyboard instruments, and its relationship to artists and participants in Europe in the seventeenth and eighteenth centuries. "Because the instrument's free touch favored its use in rendering popular airs and dances, however, its specific public consisted essentially of amateurs, in the first instance, naturally enough those belonging to sections of society which were confined to their homes—monks . . . and then, in modern times, women. . . ."[52] His description of the ubiquity and universality of the piano as an instrument of modern education parallels contemporary accounts of desktop computers and Internet access:

> The piano's present unshakeable position rests on its universal usefulness as a means of becoming acquainted at home with almost all the treasures of musical literature, on the immeasurable riches of its own literature and finally on its character as the universal instrument for the accompanist and the learners.[53]

Weber's account of the spread of the piano carefully notes, however, the specific requirements for early piano participants: bourgeois background, Northern European climate (due to the

greater time spent indoors and more developed domestic culture of Northern as opposed to Southern Europe), and the capacity for enormous amounts of free time required to master the instrument.

To return to computers, the domestic PC is taking on a kind of universal status—certainly, it has attained profound impact as a "learning machine" and as a universal object of the bourgeois domestic sphere both for educational and leisure purposes. However, recognizing these features should not preclude scholars from attending to the large-scale geopolitical, social class, gender, and political economic dimensions of its presence in schools, homes, and workplaces. School credentials have become more necessary on the job market, even as the public school system has failed. Decisive choices about schooling are made earlier in children's lives. Demands originating in the corporate world for skilled, technically competent workers constantly necessitate discussions of youth and digital learning, and influence our descriptions of best practices. Yet, high tech jobs on the whole have experienced far less growth than predicted, as compared to service jobs and skilled trades.[54] When students do find a "high tech" job, it is more likely to be the kind described at the beginning of this essay: Marco's work installing DSL lines in upscale neighborhoods for Time Warner. The High Tech High credo is "Technology is not a subject, it is the primary mode of learning." Yet, this is a formalist view of pedagogy; technological determinism conveniently erases the struggle over curricular content, and how that content should concern historical, ethical, social, and esthetic concerns that are necessary for democracy.

We need efforts to invigorate the experience of school because it consists, for so many students, of a grinding repetition of failure—and is, in Bourdieu's words "rooted in absolute uncertainty about the future and in the conflicting aspirations that school opens and closes at one and the same time."[55] Student enthusiasm for computers and the internet has been embraced in many settings as a means of trading access for a stronger investment in learning and the life of the classroom. Yet, we must also ask deeper questions about digital learning that encompass the undesirable consequences—the ways learning through technology favors higher income and better equipped students, and the forms of knowledge that tend to be excluded in the digital environment. Pedagogical strategies must be framed in the specifics of local, diverse groups of learners. As Peters warns:

> When we talk of the knowledge economy, we must realize that knowledge has a strong cultural and local dimension as well as a universalistic dimension . . . the other half of the equation that often gets forgotten in development talk. We should speak, then, of knowledge cultures (in the plural) and cultural knowledges, just as we should acknowledge alongside the knowledge economy, the economy of knowledges.[56]

School reform efforts of the last decades have tended to devalue local knowledge, fluency in Spanish and languages other than English, and to discredit the perspective and understanding gained from the immigration experience, and the "culture of caring," as Angela Valenzuela has documented in her study of Texas high schools.[57] This complete discreditation of the forms of cultural capital that students already possess is summed up by one of Rosenstock's often-repeated statements: "You want to transform where kids are going, not replicate where they've come from."[58]

Weber's account of piano history takes care to note the instruments and musical systems that were lost or discounted by the rise of the piano—as well as the amateur musical culture of users, artists, and performers whose culture diminished. We need to bring into our account of digital learning the same keen attention to the forms of cultural knowledge—cultural

and social capital—that are underrepresented on the internet and marginalized by new technologies.

Conclusion

In the field of cyber education, it pays to be optimistic. The government and the private corporations whose interests it guards like to hear that the use of digital media is a superior "delivery system" for learning. In other words, there are powerful economic interests behind the promotion of hardware and software in educational institutions at all levels. As D. A. Menchnik has noted, this has made "the line that separates benevolent, authentic concern for student learning enrichment from self-interested entrepreneurship difficult to ascertain."[59] This is a pessimistic essay. I earned my pessimism the hard way—by teaching computers and the internet in an after-school elementary program for four years. The children in that program astonished me with their resilience and their deep experience of the complexities of the global. I am not pessimistic about the ability of children to learn rapidly about technology when provided with good opportunities, and to think critically about the new media environment. I am pessimistic about the long-term effects on public education of the vast concentration of wealth at the top that has accompanied the digital revolution, the unprecedented concentration of media ownership, and the shift of power from the public realm to that of private corporations. I am pessimistic about the home technology divide in a society where income inequality is so immense, and profit imperatives prevail over the social good. I am even more pessimistic about the future of public schools, especially if they are to be entrusted to the Gates Foundation.

The rise of digital technologies coincided with the blockage of opportunity in affordable, public higher education, intensified antiimmigrant policies, and a disturbing increase in the numbers of children living below the poverty line. When corporations set the goals for classroom technology use, the goal of strong digital literacy falls far short of its potential to foster critical thinking.[60] As Raymond Williams reminds us, about literacy in nineteenth century England: "the acquisition of literacy, then as now, almost always involved submission to a lengthy period of social training—education—in which quite other things than literacy or similar skills were taught; in which, in fact values and norms were taught which became, very often, inextricable from the literacy."[61] We need to develop an ideal of strong digital literacy that would encompass both the capacity to author in ways that might impact civil society and an understanding of the political economy of new media that includes not only challenges to intellectual property and copyright, but also an analysis of wealth distribution and the potential for exploitation in labor involving computers.

The analogy of the piano and the computer, in light of Bourdieu's model of social, economic, and cultural capital, has demonstrated some of the fallacies of logic behind digital technology as a cure-all for education. Steinway has always made exaggerated, optimistic predictions in its marketing campaigns: vastly overestimating the statistical occurrence of musical genius in the general population, as well as the chances for success as a musical impresario. Yet, no school board would decide to purchase a Steinway for every student as a means of enriching the overall achievement of students or their motivation to learn. No educator would accept the elimination of curricular content that would be necessary in order for children to learn the piano during normal school hours. It would be preposterous to imagine that a child could master the piano at school without having access to one at home. Laptops might seem cheaper than baby grand pianos, but with the planned obsolescence of

hardware and software, they are more costly over the long run, in terms of the continual need to replace and upgrade them. There are pressing questions about the sustainability of a technology emphasis in K-12 education, how long the generosity of even the wealthiest parties, such as the Gates Foundation, will last, and what will have been lost when his educational interventions are done. Computers might seem more necessary to modern life than the piano, but the costs of rewriting the curriculum to accommodate them are as yet uncalculated. The time for technological utopianism is past: we need to be clear and precise about the goals and the feasibility of technology learning, in the context of a realistic assessment of the labor market and widening class divides, struggles for fair employment in both technology industries and other job sectors, and the pressing need to empower students as citizens who can participate actively in a democracy.

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