

Lost in Cyberspace: A Review of *Disrupting Class*

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Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns.
Clayton M. Christensen, Michael B. Horn, & Curtis W. Johnson. McGraw-Hill, 2008.

In *Disrupting Class*, Clayton Christensen and colleagues write about the seismic shifts in many industries caused by what they call “disruptive technologies.” The book focuses especially on the ways that schools can respond to the rapidly evolving technologies of the Web, computers, and related digital tools.

Disrupting Class has created a loud buzz in the education community and beyond. Christensen, Horn, and Johnson promote their ideas in publications as varied as *Business Week* and *Education Week* and speak at many conferences, so I looked forward to reading the book.

Strengths of the Book

I found one strength of the book is that the authors know a great deal about how technological change has affected many different industries and provide readers with some of the lessons to be drawn from these experiences. They remind us how quickly change can occur in an era of rapid-fire technological innovation.

Schools, they argue, need to more clearly understand the profound changes and opportunities brought about by digital tools, especially computers and the Internet. Schools must then move beyond understanding to incorporate new technologies in appropriate ways. If they do not, there is greater potential that new technologies will disrupt schools in negative ways.

One of the core ideas in the book is that new technologies often are initially less capable than the technologies they will ultimately replace. For example, the first wireless phones were not very effective, nor were the first personal computers. Existing businesses and industries may underestimate the long-term impacts of new technologies if they fail to understand how much and how quickly the devices or services will improve.

Another central idea is that new technologies often succeed first in markets or market niches that were poorly served by the older technologies. This allows new technologies to grow and mature for a while without competing directly with the old technologies. Existing businesses may be lulled into complacency and not spend time and money incorporating and

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improving the new technologies, thinking of them as merely inferior to the old ones and capable only of filling an unimportant market niche. They will later regret their lack of foresight.

Disrupting Class recommends that schools use computers and related technologies to help students who are poorly served, or not served at all, by the current technology of education—that is, by the schools most of us grew up with. In addition, elementary and secondary students ought to use computers, the Internet, and other digital tools directly, not necessarily through a school. In these ways, schools, students, and families will help promising computer-based technologies grow and improve. The book reminds us that industries (not that education is an industry; the public sector faces different challenges than for-profit companies) can pay a huge price for not changing in time to accommodate new technologies. The authors seem genuinely to want schools to improve and succeed.

Finally, another important set of ideas in the book concern what others have called digital “learning objects,” meaning electronic tools, lessons, or pieces of curriculum that may be used or combined in a variety of ways. The Concord Consortium is one of many organizations that has been developing learning objects for years. We are especially interested in creating and sharing *open source* learning objects, which are made available to others for use at no cost.¹ Although the authors seem unaware of the considerable and complex history of this subject,² and that millions of dollars have been spent to design various *systems* for creating, categorizing, finding, licensing, and using learning objects of many types, their sense that learning objects will become more important, and will help teachers and students in many ways, is one that is widely shared.

These are timely ideas to consider. The buzz about the book, including favorable blurbs by prominent people, suggests that many individuals, educators and others, have not thought enough about these ideas. The book may be stimulating people to think and that could be good—if the book provided accurate information and tools to help people think clearly.

Weaknesses of the Book

Unfortunately, *Disrupting Class* is a disappointing, poorly researched book that provides little useful guidance to schools. That is not my opinion alone. One online review says, “Read this book to understand innovation and how it is disseminated; read other books to understand innovative education.”³ Another, by the conservative writer Nathan Glazer, says the book “breathes a degree of confidence that is on the whole foreign to the world of education” (a polite way of saying the tone is arrogant). Glazer, too, is not persuaded by the logic in the book, saying he “remains skeptical” of the core arguments.⁴ Yet *Disrupting Class* is garnering too much attention for me and others knowledgeable about educational technology to ignore it.

In 1995 Gerhard Casper, then president of Stanford University, gave a speech in which he said, “*The first few decades of this [coming] millennium may bring more changes to universities than their first thousand years.*”⁵ He was referring, of course, to the then brand-new World Wide Web and the online digital world that was rapidly emerging. (Since then, MIT has made all its courses freely available on the Web, and many universities offer courses online.) Seymour Papert, an MIT professor, the inspiration for Maine’s school laptop program, and a guru for many educators, has believed for more than 20 years that the computer will “blow up” the school, making it obsolete—a concept of which he approves. In other words, people have been studying, thinking, and writing about how computers and networks will impact education for

decades. Yet *Disrupting Class* will give many readers the false impression that Christensen and co-authors are the first ones to have thought carefully about this issue. Much of the useful work that has been done in the past is ignored, discarded, or disparaged.

For example, the idea that computer-based technology should be used to assist students who are not well-served in current schools is an old one. For decades, the federal government has spent billions of dollars trying to improve education for poor, rural, and other educationally disadvantaged students using the best and newest technology available. The use of satellites for distance education in Alaska was pioneered by the federal government more than 30 years ago in order to bring new ideas and courses to remote communities. Sesame Street was developed in the 1960s to help disadvantaged students learn literacy and other skills in their homes, and was found to be effective. Computer-assisted instruction has been used for decades most of all by schools serving high proportions of students from low-income families, specifically to provide them with an alternative approach to conventional instruction. Computers were viewed as patient, able to tailor instruction to individual needs, and a source of quick feedback and reinforcement in ways that only a tutor could otherwise have provided. Research by Educational Testing Service decades ago showed that this type of computer instruction worked; i.e., it increased students' performance on tests of discrete skills such as arithmetic and spelling.⁶ In summary, for more than a generation schools have used available, then-new technologies to help under-served students. Indeed, for decades the federal Title I program (compensatory education for disadvantaged students) was the largest funding source for computers in schools.

The fact that these efforts proved insufficient to improve education to the levels we want and need leads one to conclude that the available technologies are not, by themselves, capable of doing the job, whether used in school or outside it. Almost every person interested in education has concluded that digital tools have many virtues, but are not a silver bullet or a panacea. *Disrupting Class*, on the other hand, seems to share the view of the utopians, who have claimed for years that technology will replace teaching as we know it. According to the book, this will happen “because of the technological and economic advantages of computer-based learning, compared to the monolithic school model” (p. 99).

However, the authors provide few concrete examples of successful computer-based learning. The book switches back and forth among terms like “computer-based learning,” “computer-based technology,” and “courses delivered online” as if they were synonyms. Yet they are not because almost all online high school courses are offered by real, live human teachers. The courses are “computer based” mainly in the sense that a phone conversation is “telephone based.” The computer is the medium for online courses, but software is not the teacher, as it is in computer-assisted instruction. It would be nearly impossible to find an example of high-quality, distance “computer-based learning” replacing a high school course.

Yet one of the most-repeated claims in the book is that “by 2019, about 50 percent of high school courses will be delivered online” (p. 98). Many experts, including experienced leaders of online schools and others who have studied them for years, find this claim unbelievable. The book's repeated use of different terms is confusing, so different readers take away different meanings. Some readers believe the authors mean online courses such as are offered now—but, if so, that would in effect require half of all high school teachers to teach only via the Internet. That's not going to happen (nor should it), and besides, having more online teaching will not address shortages of qualified teachers in certain fields. A qualified teacher is a qualified

teacher, regardless of the medium used—although online teaching that provides greater value than a paper-based correspondence course is challenging to do well. Other readers believe the authors mean true computer-based (that is software-based) courses. Only the latter—which basically don't exist—will have the “technological and economic advantages” that the authors claim are so important.

Consider the economic advantages. The largest online high school in the nation is the Florida Virtual School (FLVS). Like other online high schools, FLVS hires human teachers who are trained to provide online courses, which must be delivered and taught in very different ways than face-to-face courses. By statute, the Florida Virtual School is given 11% *more* per course enrollment than a face-to-face school to pay for instruction and administration,⁷ with the money transferred from the brick-and-mortar school's allotment to FLVS. Additionally, a publication of the North American Council for Online Learning (NACOL) states that indications are “the cost of online courses is about the same as traditional classroom classes.”⁸ *Disrupting Class* ought to explain that it is *not* instruction that costs less in online high schools. Instead, online schools do not pay for buildings, meals, transportation, libraries, theaters, art rooms, science labs, and other features of brick-and-mortar schools. Are the authors recommending we give up those features in order to gain an economic advantage?

In other words, Christensen and his colleagues wish into existence high-quality, low-cost, software-based courses. Perhaps these will exist some day, perhaps not. The authors do not say clearly, as they should, that when they project that 50% of high school courses will be delivered online they are mainly discussing technologies that do not exist. They imagine advantages of computer-based learning, but provide almost no examples and offer little hard evidence that computer-based learning is or will be better than traditional instruction. The book suggests these emerging software-based courses will be customized in response to students' “learning styles,” but the latter is a concept without a widely accepted definition or evidence of effectiveness.

Readers as well as the authors of *Disrupting Class* might be interested in hybrid courses, partly based on computers, because these might one day lead to fully automated, computer-based learning. Carnegie Learning, for example, develops and delivers high school courses in a few subjects that are taught partly by human teachers and partly through computer software. In 2004, the U.S. Department of Education's What Works clearinghouse gave good marks to the research identifying one of these courses as effective.⁹

But Christensen and co-authors demonstrate far too little interest in anything schools are *actually* doing with computers, besides online courses, declaring that “the way schools have employed computers has been perfectly predictable, perfectly logical—and perfectly wrong” (p. 73). Carnegie Learning's courses? Perfectly wrong. Using computers to read aloud to blind students or struggling readers? Perfectly wrong. Evidence from the lab of a Nobel Prize winner that teaching students physics using less costly virtual laboratory simulations can be as effective as using actual laboratory equipment? Perfectly wrong. Providing online professional development for teachers? Perfectly wrong. Spending tens of billions of dollars to connect every school in the nation to the Internet? Perfectly wrong. Having students use word processors to revise text more often and thus become better writers? Perfectly wrong. Almost nothing that is done with technology by schools is good, according to *Disrupting Class*. The authors' philosophy appears to be, “heads, we are right; tails, schools are wrong.”

The book's claim that everything schools have done with computers is "perfectly wrong" is especially odd considering that most states officially support online schooling, which is what *Disrupting Class* pins its hopes on. Education policymakers and the schools have been working hard, often successfully, to adapt and incorporate technology even while it evolves at lightning speed. Remember, the Web has existed for only 15 years and already 44 states support online schooling, a trend that began more than a decade ago when the Virtual High School and the Florida Virtual School began offering services. Schools are not ignoring the possibilities offered by technology. Moreover, schools use online courses most often for the very purpose that *Disrupting Class* suggests, namely to provide students with courses not available in the student's own brick-and-mortar school, which is an example of what the authors call working "under and around" the existing paradigm. Might the book give thousands of schools and dozens of states credit for adopting this approach years ago, instead of claiming that all that schools have done with computers is "perfectly wrong"? Could the authors explain what makes good online learning effective and what pitfalls to avoid? (News flash: online learning is not all high quality, and the least expensive online courses are likely to be the ones providing students with less of the support and interaction they need. Some states have tightened regulations after uncovering serious deficiencies with a few "cyber charter schools.") Might they help readers understand the radically different approaches and funding mechanisms that are used in different states and districts?¹⁰ Understanding these matters would require deeper knowledge of schooling, online offerings, and school finance than the authors possess. To their credit they admit they are not experts in education, but it would have helped the book if they were.

One development of many about which they seem confused is called "blended learning," which combines traditional face-to-face courses with online supplements. Michigan (2006) and Alabama (2008) have begun to require high school students to have experiences using online learning. The authors claim this is a misguided measure (p. 118, footnote 20) because Christensen et al. interpret the mandate to mean these courses must be offered *completely* online. However, both states allow the experience to come from blended learning courses offered in brick-and-mortar schools, as well as from totally online courses. Blended learning has the potential to combine advantages of online learning, such as 24/7 access to threaded discussions and other resources, with the strengths of face-to-face instruction, including frequent in-person connections with a teacher and other students. (Even so, no one has suggested that *all* high school courses need or would benefit from an online component. In higher education such requirements sometimes lead to pro forma implementations that are not useful.)

Christensen and his colleagues would like to see education become more "student-centric," meaning more individualized. That has been a dream of computer software developers for ages. But the authors say too little about students' need to have contact with live adults and peers. In online courses, a teacher is in charge, responding to questions and moderating discussions. The better the teacher, the better the course. In addition, the neediest students, including those who drop out of high school in appalling numbers, are not likely to sit down at a computer at home and educate themselves, regardless of the quality of computer software. Teachers in successful high-need schools play an essential role in counseling students, inspiring them, pushing them, and working with them every day as human beings, not just acting as machine-like instructors.

And yet an increasing number of cyber charter schools are being supported in some, but not all, states. These schools compete directly with brick-and-mortar schools for funding. The

students most likely to enroll in and benefit from a program that is delivered entirely online are those with supportive parents, a quiet place to study, and other advantages. From a policy perspective, there is an important difference between online courses as supplements to face-to-face offerings versus online schools as substitutes for brick-and-mortar schools. By siphoning money from brick-and-mortar schools to cyber charter schools, states reduce funding for school libraries, counselors, lunch programs, athletics, art rooms, the opportunity to interact face-to-face with students from a different background, and the many other things found in traditional schools. In all likelihood, funding more cyber charter schools at the expense of brick-and-mortar schools will leave behind a harder-to-educate group of students to serve with less money.

How should policymakers deal with this dilemma? The book is almost completely silent on this vital issue. One sentence (p. 104) says that “officials must not spoil the technology’s long-range economic advantage through well-intentioned but flawed funding formulas that penalize per-pupil funding of schools when a student takes an online course.” However, that is, in fact, what happens when a student from a traditional school takes an online FLVS course, and it is what happens in states supporting “cyber charter schools.” Apart from that one sentence, the authors do not comment on these or other real-world funding examples, leaving readers to wonder how they would finance online education, the decade-old innovation they highly recommend. The issue is increasingly important; Florida, for example, recently mandated that all school districts in the state support full-time online education for students in grades K-8.¹¹ But, unlike in the other industries described in *Disrupting Class*, schools have no profits to reinvest, and almost no R&D funds, and yet face increasingly difficult, real-world funding choices.

To save money, would Christensen, Horn, and Johnson recommend that schools abandon the use of computers altogether? The book states that computers have had little effect “save possibly to increase costs and draw resources away from other school priorities” (p. 72). Tell that to the special education teachers who use computers and swear by them, or the teachers of civics and current events for whom outdated textbooks are an inferior teaching tool compared to the Web, or the roughly 50% of high school science teachers who use “probes” to collect, display, and analyze lab data on computers, or the states like Virginia and Oregon that are making student assessments more efficient and useful by delivering the assessments online, or ... the list is very long and includes many applications of digital tools not even hinted at in *Disrupting Class*. See *Transforming Schools with Technology* for dozens of examples, as well as a clear explanation of how computers are already helping schools meet a variety of key education goals, despite the fact that they are no panacea.¹²

One assumes that professors from business schools often work with big numbers. But in a recent *Business Week* article, Christensen and Horn write, “We have spent well over \$60 billion during the last two decades equipping schools with computers, yet the basic classroom has changed little.”¹³ Many classrooms *have* changed—but let’s focus on the numbers. Sixty billion dollars over two decades is \$3 billion per year. With an average of 45 million public school students each year, that equals \$67 per student per year. Is that what the authors mean when they complain of increasing costs? It’s considerably less than 1% of the national per-pupil expenditure of \$8,701 in 2004-2005. Sixty-seven dollars is less than the cost of most textbooks and less than many young people spend on video games each year.

What You Should Make of *Disrupting Class*

Thousands of people have worked for decades on the problems and opportunities raised by integrating technology into schools. Also, Gerhard Casper, Seymour Papert, Alfred Bork, and many others have thought about what the long-term consequences for education will be. *Disrupting Class* comes along at a time when these questions are more important than they have ever been because the technology is more mature and ubiquitous. Essentially everyone now uses the Web as a learning tool.

Readers may learn something about the process of innovation from *Disrupting Class*, especially about innovative *products* produced for *profit*. What they will not learn is how creative school systems have for years been applying technology in precisely the ways that *Disrupting Class* has recommended, namely to individualize learning, make it more effective for greater numbers of students, and to offer alternatives to students who are not being served well by existing schools.

Educators will also learn little or nothing about how to fund online learning, laptop programs, or other technology innovations. They will not find a vision of how cyber charter schools, full-time online high schools, and similar innovations can co-exist with regular public schools and yet not remove more and more funds from brick-and-mortar schools, leaving them with the most difficult-to-educate students. Readers will learn nothing about lessons learned in higher education, as many colleges and universities face similar challenges.

The authors may not intend to offend, but the contempt they show for the thousands of people whose work they claim is “perfectly predictable” and “perfectly wrong” is breathtaking. For example, teachers’ unions are identified as a villain, wielding so much influence over “textbook and instructional software adoption decisions” that “many would-be school reformers have abandoned hope of significant change” (p. 142). Yet the NEA and the AFT have publicly supported online learning.¹⁴ It has been social and political conservatives in southern states, including state boards of education—not unions—that make textbook adoption a trial for those who want to include human evolution or other unpopular ideas. Many national surveys show teachers support the use of technology, and in particular the data show that teachers are very enthusiastic about programs in which every teacher and student receives a laptop.¹⁵

Prospective readers should view these authors as among the many well-intentioned people who have approached education believing it will only be possible to reform schools if everyone listens to their message. Edison Schools, charter schools, private schools, various model schools funded by the U.S. Department of Education—there is a long list of ideas that proponents were sure would improve schools. Innovators’ certainty usually disappears once they must prove that their schools or their approaches to education are demonstrably an improvement.

For better and for worse, large social systems change more slowly than technology. Even in medicine, which has far greater experience using sophisticated technology than schools, the *New England Journal of Medicine* reported in 2008 that only one doctor in five uses electronic records, although they have many benefits.¹⁶ Schools, teachers, education policymakers, and unions are not living in a 19th century world as *Disrupting Class* seems to suggest. Tens of thousands of schools are working to incorporate technology. *Disrupting Class* urges them to do better, but gives schools almost no credit for steps they have taken and provides few practical guidelines to help them in this important effort.

Endnotes

¹ An example is our Molecular Workbench, which cost millions of dollars to develop and combines accurate, dynamic visual models of the interaction of atoms and molecules with an authoring environment allowing creation of hundreds of lessons based on these models on topics ranging from protein folding to osmosis. See <http://www.concord.org/resources/browse/172/> for these and many other free resources.

² One could begin by consulting Wikipedia, http://en.wikipedia.org/wiki/Learning_object

³ Reviewed by Gary Ackerman at <http://www.lib.msu.edu/corby/reviews/posted/christensen.htm>

⁴ Reviewed in *Education Next*, 8:4 (Fall 2008), <http://www.hoover.org/publications/ednext/27151049.html>

⁵ *Come the millennium, where the university?* Address by Gerhard Casper to the annual meeting of the American Educational Research Association, San Francisco, April 8, 1995.

⁶ Ragosta, M., Holland, P. W., & Jamison, D. T. (1982). *Computer-assisted instruction and compensatory education: The ETS/LAUSD study: The final report*. Washington, DC: U.S. Department of Education.

⁷ See http://www.myfloridahouse.gov/FileStores/Web/Statutes/FS07/CH1011/Section_1011.62.HTM, section (r). FLVS is paid per course completion. For funding purposes, twelve half-credit courses per year equals one FTE.

⁸ Watson, J. (2007). *A national primer on K-12 online learning*. North American Council for Online Learning. (www.nacol.org)

⁹ What Works Clearinghouse. (2004). *Intervention report: Cognitive Tutor*. Retrieved 4/20/07 from <http://www.whatworks.ed.gov/PDF/Intervention/WWC-CT%20120204%20v10.html>

¹⁰ Watson, J., Gemin, B., & Ryan, J. (2008). *Keeping pace with K-12 online learning: A review of state-level policy and practice*. Evergreen, CO: Evergreen Consulting Associates. See www.kpk12.com

¹¹ Florida House Bill 7067; available in summary at http://www.fldoe.org/GR/Bill_Summary/2008/HB7067.pdf.

¹² Zucker, A. A. (2008). *Transforming schools with technology: How smart use of digital tools helps achieve six key education goals*. Cambridge, MA: Harvard Education Press.

¹³ Christensen, C., & Horn, M. B. (October 21, 2008). McCain: Education's disruptor-in-chief? *Business Week*.

¹⁴ Among many publications see: National Education Association. (2006). *Guide to teaching online courses*. Washington, DC: Author. <http://www.nea.org/technology/onlineteachguide.html>

¹⁵ E.g., Davis, D., Garas, N., Hopstock, P., Kellum, A., & Stephenson, T. (2005). *Henrico County Public Schools iBook survey report*. Arlington, VA: Development Associates, Inc.

¹⁶ DesRoches, C.M., et al. (2008). Electronic health records in ambulatory care - A national survey of physicians. *New England Journal of Medicine*. 359(1), 50-60.