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Virtual Schools in the U.S. 2013:
Politics, Performance, Policy, and Research Evidence

Section III
Claims and Evidence:
The Virtual Schools Research Base

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May 2013

Historically, advocates promoting new technologies in schools have promised a great deal. Champions of virtual schooling are no exception. Consider, for example, the answer that Clayton Christensen, author of *Disrupting Class: How Disruptive Innovation Will Transform the Way the World Learns* (2008) gave when asked: "Do you think that education is finally ready for the Internet?"

> I absolutely do. I think that not only are we ready but adoption is occurring at a faster rate than we had thought.... We believe that by the year 2019 half of all classes for grades K-12 will be taught online.... The rise of online learning carries with it an unprecedented opportunity to transform the schooling system into a student-centric one that can affordably customize for different student needs by allowing all students to learn at their appropriate pace and path, thereby allowing each student to realize his or her fullest potential....[1]

Christensen's sweeping claims are typical: that 50 percent of all children and youth will be taught online by 2019, and that U.S. schooling will morph from a teacher-centered, age-graded, one-size-fits-all classroom system to a student-centered system providing fully customized, individual instruction for students across scattered locations. Unfortunately, no research to date justifies either claim.[2,3] The models of virtual education embedded in such predictions—as well as their actual effects on students from diverse backgrounds with disparate abilities and needs—can only be guessed.[4] As indicated earlier in this report, many data are incomplete and allow only uncertain inferences.

Advocates' hyperbole[5] obscures how little is actually known about the effects of online schooling and how difficult it is to determine what constitutes high quality virtual learning. Current research suffers not only from incomplete and sometimes conflicting results, but also from a lack of comparable data. For example, schools studied may be totally non-profit, totally for-profit, or some mix of both, making comparisons difficult.[6] Moreover, available studies use different research designs, reflect the experiences of widely different students, illustrate wide variation in teacher instruction, and define and measure the quality of online teaching and learning in differing ways. For example, students receiving online instruction include: children who are home-schooled; children with disabilities who are homebound; high school students who are enrolled in Advanced Placement courses, or in International Baccalaureate diploma programs; teenagers who are working toward credit recovery for failed courses; and, elementary school students who are in classes that blend individual "learning labs" with regular classroom instruction.[7]

Differences are also evident in curriculum and instruction.[8] Some virtual schools provide course sections with enrollments as few as fifteen, with teachers holding online discussions, having periodic face-to-face contact, and exchanging frequent email messages. Others showcase teachers lecturing and demonstrating lessons to thousands of students at one time. Some online education relies less on teachers, instead emphasizing engaging software programs loaded with audio and video clips that take students point-by-point through carefully designed materials. Such programs quiz students on material, then re-teach concepts and skills for students who do poorly while allowing students who do well to push ahead with advanced material.[9] Other programs rely on software stressing rote memorization that depends primarily on short bursts of teacher telling and multiple-choice questions to check understanding, an electronic version of typical, and unengaging, skill-and-drill classroom teaching. When teachers do play a substantive role, the quality of online teaching also varies. There are acclaimed instructors who seem to relish the work, plan thoughtfully, and use the limited face-to-face interaction and discussion threads creatively.[10] Other online teachers simply complete assigned tasks dutifully.

Given such wide and substantive variations, it is difficult to even make sense of the claim that "technological innovation" will revolutionize teaching and learning. What kind of innovation, for which students, taught by whom, for what purpose exactly, using what methods? Can any or all versions of online schooling produce the achievement gains its advocates predict?

Although researchers have asked whether technological innovations produce learning that equals, exceeds, or falls short of the learning that traditional instruction produces, after a

half-century of inquiry available data still cannot answer the question. Instead, researchers have produced decades of weak studies that offer little compelling evidence of enhanced student achievement.[11] Unfortunately, virtual school advocates nevertheless routinely cite flawed studies to support their claims.[12] Even more unfortunately, lacking strong evidence, they substitute unsubstantiated claims or misrepresent credible research findings about virtual education to make their case.

Following is a review of typical claims about the superiority of virtual education and some realities they ignore, and then a review of weaknesses in existing research and an example of how findings from credible research are distorted to support a push for technological expansion. Together, this material demonstrates that hyperbolic claims for the superiority of online teaching and learning rest on a wholly unsupported foundation—despite the claims proponents may make about purported advantages and research support for them.

Tenets of the Faith in Virtual Education

As support for their position, advocates of virtual education typically detail perceived weaknesses of traditional schooling and then claim that virtual education in and of itself will remedy them. Unfortunately, how or why online instruction might reliably alleviate problems often remains unexplained, making it difficult to understand why some weaknesses would disappear if a student were sitting at a computer rather than in a classroom and ignoring the possibility that creative teachers may already be alleviating problems by creating high-energy, face-to-face classrooms. The following claims are commonly made, despite a lack of credible research evidence and without attention to real-world complexities that raise questions about them.

According to many advocates, online instruction alleviates stresses of traditional whole-class instruction. Champions of virtual learning claim that the age-graded school has forced teachers to present the same material to a group of 25-30 students at one time, generation after generation; in doing so this structure has created tedium and boredom for students, given that some will already know the content while others will be too far behind to grasp a lesson. Moreover, proponents point out that teachers facing large class sizes have been hard-pressed to meet district and state requirements for covering the curriculum and moving all students to proficiency.

With online instruction, however, advocates maintain that lessons will become more individualized. Online instruction and blended learning are said to provide "differentiated instruction," taking all learners from where they are today to their full potential tomorrow. Moreover, technological innovations permit some regular classroom teachers to "flip" their lessons. That is, students can prepare for class by watching teacher lectures online at home, or by working through online programs; teachers might then use class time for a variety of activities, like one-on-one conferences and small group work, helping students work through difficulties with content while strengthening their critical thinking, analytical, and problem solving skills.[13]

Such claims are generally made without any attention to real-world complications that affect not only traditional classrooms but that apply to online offerings as well. Unexamined issues include, for example: the extent to which mandated Common Core standards and high stakes testing might limit curricular and instructional creativity in any

> *Before offering more support for virtual education generally, policymakers would be wise to promote and wait for better information from more stringent research.*

format; why a lecture that might be boring in person would somehow become an asset in an online environment; and whether re-teaching in a repetitive drill format might be less mind-numbing online than in a traditional classroom.

Another assertion that advocates make is that unlike traditional instruction, virtual learning will energize disengaged and underachieving students. Promoters of online courses and blended learning say repeatedly that unmotivated students will work harder, gain more knowledge and skills, and embrace learning in an online environment. They predict that newly engaged students will subsequently achieve higher grades and persevere in their studies until they graduate high school. In short, advocates assert that moving instruction online will motivate every student to attain proficiency in knowledge and skills so that they are prepared to enter college or careers in a highly competitive global economy.

Proponents, however, do not explain which intrinsic elements of online education would motivate students who have disengaged because of limited English proficiency or limited literacy, or who need to work long hours to help support an economically distressed family, or who see in their communities no role models or reason to believe they can ever compete fairly in any desirable job market. Again, complex factors that influence individual achievement are not taken into account in sweeping claims about the ability of technology to solve intransigent problems in traditional classrooms.

Advocates also argue that unlike traditional instruction, which is disconnected from the world of work, online instruction will ensure students develop critical competencies.[14] Current content and skills taught in academic subjects, promoters assert, seldom have real-world connections. Moreover, they charge that while high-tech devices are increasingly available in traditional schools, student use is often restricted to low-level tasks, squandering the technology's enormous potential for delivering information and fostering communication. According to this argument, because digital competence is necessary for workers in an information-based economy, students graduate unprepared for life after school. Proponents assert that online instruction will close the gap between what schools offer, what students do in daily lessons, and what youth will face when they graduate.

Again, the assumption that online instruction will automatically provide better preparation for college or the world of work is simply an article of faith, since it can (and

often does) rely heavily on low-level tasks like repetitive quizzing and drilling. Moreover, even if complex technological tasks are assigned, it is not clear that such assignments automatically translate to better job skills. For example, students experienced in creating online videos might find that skill less useful in the workplace than the more mundane skills of word processing and spreadsheet manipulation.

Another assertion that proponents often make is that online instruction can stem the rising costs of schooling children and youth. Many point out often that the single largest item in K-12 budgets is salaries for classroom teachers. Because virtual schools, cyber-charters, and blended schools hire fewer teachers, average expenses for online schooling can be lower than costs for operating regular age-graded schools. Finance issues have been explored in detail above, but for the purposes of this discussion, it is worth noting that the national average expenditure for instruction in regular schools is some $10, 000 per student. Costs for virtual schools range on average from $5,100 to $7,700 per student, and for blended schools $7,600 to $10, 200.[15] While there are conflicting estimates of the costs among policy advocates and opponents and some questions about profiteering, few would question the claim that online instruction can be cheaper than providing a teacher for every class in an age-graded, brick-and-mortar school.

Whether *high quality* online instruction might be cheaper is another question that few backers ask, much less answer. For example, in some cases teachers may be replaced by parents, or other non-professional laboratory aides, who monitor student work and who are unlikely to be expert in the subject at hand.[16] It is possible that lower financial cost may come at the price of weakened teaching and learning.

Lack of Credibility in Claims Citing Research

As just noted, advocates often present the purported advantages of online instruction as self-evident truths; however, they do at times cite research support in an effort to make their arguments more credible. There are two reasons for skepticism about such citations. The first is that there are several weaknesses in the existing research base. The second is that findings of credible research studies can be, and are, taken out of context and misrepresented.

To begin, reliable research results are scant and mixed. The results of meta-analyses of hundreds of K-12 studies do not decisively show that students who take online courses or enroll in full-time virtual schools perform even marginally better than students who are in traditional teacher-led classrooms.[17]And, the research presented earlier in this report demonstrates that the common measures of Adequate Yearly Progress, state school performance rankings, and on-time graduation rates demonstrate no advantage for full-time virtual schools.

Even more striking than a lack of convincing findings to support online education is the weakness of existing studies. Meta-analyses have found few studies of virtual instruction in K-12 schools that meet a minimum threshold for quality of design, sampling, and

methods. For example, in the recent and often cited meta-analysis from the U.S. Department of Education (2010) mentioned in Section 2, researchers found:

> *Few rigorous research studies of the effectiveness of online learning for K–12 students have been published*. [Italics in original.] A systematic search of the research literature from 1994 through 2006 found no experimental or controlled quasi-experimental studies comparing the learning effects of online versus face-to-face instruction for K–12 students that provide sufficient data to compute an effect size. A subsequent search that expanded the time frame through July 2008 identified just five published studies meeting meta-analysis criteria.[18]

The authors conclude that these five studies:

> [comprise] a very small number of studies, especially considering the extent to which secondary schools are using online courses and the rapid growth of online instruction in K–12 education as a whole. Educators making decisions about online learning need rigorous research examining the effectiveness of online learning for different types of students and subject matter as well as studies of the relative effectiveness of different online learning practices.[19]

In short, given the results of the few rigorous K-12 studies that have been done, there is insufficient evidence for policymakers to promote major online initiatives in either elementary or secondary schools.

Moreover, much of the research being done suffers from bias**.** Online instruction advocates cite research support for the superiority of virtual education often referring to studies drawn from a mix of academic and vendor-produced work.[20] Since it is unlikely that sponsored research with findings undermining a particular innovation would be funded for very long, at the very least such potentially biased work would need to be confirmed by independent researchers. And, of course, commercial research funders can suppress any study that might yield undesirable findings, even if the researchers they hired produced one.

Another form of bias in studies is evident in the sampling of students and teachers included. As just one example, there is a well-known correlation between poverty and low academic achievement. Therefore, findings based on a study sampling students and teachers from any one socioeconomic level cannot and should not be extrapolated to apply to all teachers and students everywhere, as is common in extravagant claims.[21] In addition, heavy reliance on surveys and self-reports also introduces bias.[22]As any experienced educator knows, a student may be fully convinced he or she has fully mastered material—until an assessment demonstrates little to no mastery. Students who say they are learning more, or learning more deeply or efficiently, are reporting their impressions, which may or may not align with reality.

The fact that the vast majority of research on technological innovation is unreliable has seldom stopped champions of online instruction from pressing policymakers to cite various studies in their recommendations. Thus, poorly designed studies with serious flaws that show student gains in test scores often make media headlines for millions of

readers and viewers.[23] Meanwhile, occasional well-designed studies that show modest or no gains turn up in academic journals read by a few hundred researchers. At present, there are simply too many sub-standard studies flowing from self-interested vendors and eager advocacy-driven researchers, and too few well-designed and carefully implemented studies. In fact, the point that the existing research base may make most clearly is that little is certain about the effects of technological innovation.

Unfortunately, that fact is often obscured by articles that misrepresent the findings of the few credible studies that exist. For example, in an article titled "How Online Learning is Revolutionizing Education and Benefiting Students,"[24] Dan Lips has this to say about the U.S. Department of Education meta-analysis noted above:

> While evidence about the effectiveness of K-12 online learning programs is limited, there is reason to believe that students can learn effectively online. In 2009, the U.S. Department of Education published a meta-analysis of evidence-based studies of K-12 and postsecondary online learning programs.[3] The study reported that "students who took all or part of their class online performed better, on average, than those taking the same course through traditional face-to-face instruction."[25]

While Lips does concede there is limited evidence, the quote from the study that he includes suggests an unqualified, positive finding relative to student achievement.

A look at that quote in its original context, however, suggests a very different picture:

> *Students in online conditions performed modestly better, on average, than those learning the same material through traditional face-to-face instruction* [italics in original]. Learning outcomes for students who engaged in online learning exceeded those of students receiving face-to-face instruction. . . Interpretation of this result, however, should take into consideration the fact that online and face-to-face conditions generally differed on multiple dimensions, including the amount of time that learners spent on task. The advantages observed for online learning conditions therefore may be the product of aspects of those treatment conditions other than the instructional delivery medium per se.[26]

Lips' discussion ignores the fact that gains were modest and, more importantly, possibly due to factors other than technology. Such manipulation suggests that claims about research-based findings should be read with some skepticism—and checked against complete, original studies.

Politics, not Research, is Driving Policy

If the benefits of technological innovation are so uncertain, as a thoughtful examination of the research base readily demonstrates, then why have local, state and federal policymakers been so quick to endorse classroom expansion of online instruction? Several

influences are at work. Although they are understandable, they do not provide a trustworthy foundation for educational policy.

Policymakers are in the public eye. Many state and local school boards and superintendents adopt elements of virtual schooling so that they are seen as technological innovators, ensuring that their districts outpace others. In addition, they can simultaneously be seen as wise budget managers who use technology to increase higher productivity—higher test scores—at a lower cost per student. Symbolic actions matter.[27]

Contemporary culture attaches a certain cachet to technology, equating it with social and economic progress. Even the term "high tech"—like high fashion, high church, high class, high society—conveys a sense of superiority, of modernity and productivity, relative to "low tech" methods and materials like chalkboards. If students are using new technologies, then their schools are seen as modern and preparing the next generation to enter higher education or the labor market with productive skills and knowledge. Being in the vanguard of innovation—as when a school buys iPads and laptops for every kindergarten student—signals to voters, taxpayers, and parents that the district wants to raise achievement using novel and purportedly engaging modes of instruction to prepare children and youth for an information-driven economy.

For example, facing a bond referendum for $8.75 million, with much of the money earmarked for new technologies, one district superintendent summarized: "We need to keep putting the best technology we can in front of our students, so when they graduate they can compete with students from all over the world."[28] He further framed the issue to voters, in fact, not in terms of demonstrated learning benefits in workplace skills but in terms of keeping up with the Joneses in other districts: "The question … is whether we can be a district that moves forward or [whether we will] just sit here and watch others pass us by." Decision makers who depend upon public support seem to fear that not adopting new technologies, even when funds are short, casts them as shortsighted district leaders failing their students by mindlessly reinforcing traditional instruction and neglecting grave educational problems.

Educational policymakers cannot ignore their public image as leaders because they need public support: critics forget that local boards of education depend on voters for funding. Expanding online instruction to enhance the reputation and status of a school district is often a politically smart move to cultivate community support for future tax levies and bond referenda. The greater the number of whiteboards, iPads and online courses, the more likely that decision makers will be considered visionary and that voters will follow their lead. Because of the expectation that greater reliance on technology will mean lower costs per student, leaders at the state, district and school level can pour money into technology and still be perceived as good budget managers.

In short, policymakers know that business, civic, and community leaders expect them to work tirelessly to improve student academic performance through every available means, including better school organization, governance, curriculum, instruction—and especially better technology. Since World War II, job number one in U.S. schools has been improving schools, making unrelenting reform a policymaker's key strategy for political survival.[29]

Unfortunately, good politics does not automatically result in good policy.

Toward Better Research and Policy

History has demonstrated that good research is an important guide to sound policy. When reliable research consistently finds positive outcomes for particular strategies, policymakers can support them confident that their investment will produce expected returns. Such has been the case, for example, for early childhood education and for career-technical academies, which have both seen widespread policy support based on a reliable research base.[30] Findings over time have helped pinpoint which students benefit from these programs and under what conditions they do so. As a result, growing implementation has produced convincing caches of new evidence demonstrating that policymakers were wise to design policy based on information researchers had established as credible.

Before offering more support for virtual education generally, policymakers would be wise to promote and wait for better information from more stringent research. There have been some beginning moves toward more focused and reliable investigations. For example, one study was designed to determine what effect, if any, providing lectures online rather than in-person might have on student learning.[31] (In this case, students receiving the in-person lecture fared better.) More such experimental studies focusing on such specific technological strategies, in a wide variety of contexts and with a wide variety of students, are necessary.[32] Of course, as findings emerge, efforts to replicate good studies and confirm or refine findings will also be important. And, collaborations between professional researchers and professional teachers,[33] now common in research on traditional schools, might also be usefully extended in studies relevant to technological innovation.

Well-designed qualitative research studies can also provide crucial insights into such areas as how teachers' and students' beliefs and perceptions influence their actions when new technologies are available, or how new technologies might change students' and teachers' thinking and behavior. For example, in one ethnographic study, researchers established that simply making laptops available to students and teachers did not automatically lead to teachers altering traditional instructional strategies, as is often expected.[34] Instead, the teachers' interrelated beliefs about how children learn, how they define good teaching, and what role technology played in their students' lives determined how the teachers used the laptops; moreover, the study found that middle school culture was an important influence on those beliefs. Another study explored how the use of laptops affected students' literacy practices; it found that those practices had become "more public, collaborative, authentic, and iterative, with greater amounts of scaffolding and feedback provided."[35] However, student use of laptops in this case did not lead to improved test scores or reductions in the achievement test score gap.

Currently, researchers know very little about how students acquire skills, attitudes, and habits of learning online. Much more information is needed about how students learn virtually if effective teaching strategies are to be designed and adopted. For example, what do students think and do when listening to online teachers, and how (if at all) is that

different from what they think and do when listening to a live teacher present in a classroom? Do different students feel more or less free to ask questions in virtual v. real environment? Are teachers better able to detect and correct student misunderstandings online or in a classroom? Do the answers to such questions vary by type of student and by subject area?

Perhaps most importantly, researchers must move beyond using test scores as a measure of student success and identify not only which outcomes must be measured but also how to measure them. To take an obvious example, a student's near perfect score on a standardized test of reading might come at too high a cost if he leaves formal education hating to read and with no intention of ever reading a newspaper or book again.

In short, there are numerous critical questions that need to be answered before policy can be designed with confidence in its outcomes. The following examples are intended to be suggestive of the range of concerns, but are far from exhaustive:

- Do students in blended learning situations (clearly defined in terms of hours per day spent working online) do worse than, as well as, or better than similar students in regular classrooms? Of course, "better" would need to be clearly defined in the study's design. Better on a test of course content, for example, or on a measure of some other area, like attitude or perseverance?

- What do elementary and secondary students from low-, middle- and high-income families actually think and do during online teacher-directed lessons taught in real-time, to all students in a class at once? Do they think differently when lessons are posted online for a fixed period of time, so that different students access the same lessons at different times?

- What do online elementary and secondary students from low-, middle, and high-income families actually think and do as they go through step-by-step top-rated math and language arts software programs?

- With which students (which age? gender? ethnicity? socioeconomic status?), under what conditions (blended schooling? real-time online instruction at home? in a classroom? computer lab? with or without aides?), and with what kind of teaching (lecture? peer group interactions? simulations? collaborative project-based learning?) is virtual schooling effective? What are measures of "effective" teaching? (standardized test scores? writing? persistence in school? growth in critical thinking skills?)

- In which academic subjects (science? math? reading? social studies? English?) is virtual instruction more or less effective? How is "effective" to be defined in each area?

- In addition to content mastery, what outcomes are so essential that they must be monitored to be sure that any gains realized through technological innovation are

not outweighed by costs in other important areas? (Perseverance? Attitude toward learning or subject area? Citizenship?)

Definitive answers to questions such as these will require multiple, well designed, large- and small-scale studies with careful controls and comparison groups, as well as longitudinal studies tracking students over several elementary and secondary grades.

At the moment, we lack information on these and many other important questions. And, without answers, there is no framework on which to build wise policy.

Recommendations

The current climate of K-12 school reform promotes uncritical acceptance of any and all virtual education innovations, despite lack of a sound research base supporting claims that technology in and of itself will improve teaching and learning.

Therefore, it is recommended that:

- Policymakers suspend requirements that students take online courses in order to graduate from high school. No reliable research has yet shown evidence of benefit from this practice.
- Policymakers refrain from establishing or further expanding full-time, taxpayer-funded virtual schools. No reliable research has yet demonstrated under what conditions, in what format, and in what specific ways virtual schools may present an advantage over existing bricks-and-mortar schools.
- State and federal policymakers create long-term programs to support independent research and evaluation of specific student learning outcomes for cyber schools, blended learning schools, and similar ventures.

Notes and References: Section III

1 Myers, C. (2011). Clayton Christensen: Why online education is ready for disruption now. *The Next Web*. Retrieved November 13, 2011, from http://thenextweb.com/insider/2011/11/13/clayton-christensen-why-online-education-is-ready-for-disruption-now/.

2 Current estimates of enrollment in online offerings suggest that such claims of exponential growth are ill-founded. For example, according to the U.S. Center for Education Statistics, there are some 55 million preK-12 students in American schools (http://www.census.gov/newsroom/releases/archives/facts_for_features_special_editions/cb11-ff15.html/). Therefore, some 27.5 million students would need to engage in virtual learning to realize Christensen's prediction—a staggering difference from current enrollments. This reports finds, for example, that enrollment in full-time virtual schools is now some 200,000 students—less than half of one percent of the student population. A more inclusive estimate, based generously on the most recent iNACOL estimates of enrollment in full-time virtual schools and in individual courses (http://www.inacol.org/press/docs/nacol_fast_facts.pdf/), suggests that some 2,000,000 students—4% of the total student population—are engaged in online learning.

See also:

Watson, J., Murin, A., Vashaw, L., Gemin, B., & Rapp, C. (2011). *Keeping pace with K-12 online learning: A review of state-level policy and practice*. Evergreen, CO: Evergreen Education Group. Retrieved May 6, 2012, from http://kpk12.com/cms/wp-content/uploads/KeepingPace2011.pdf/.

3 That most classroom teaching remains largely teacher-centered rather than student-centered, see:

Cuban, L. (2013). *Inside the Black Box of Classroom Practice: Change without Reform in American Education* Cambridge, MA: Harvard Education Press.

Examples of schools where individualized pacing of lessons—one version of student-centered instruction—exist in scattered places across the U.S. The School of One in New York City (http://schoolofone.org/) and elsewhere is one example, and Carpe Diem (http://www.carpediemschools.com/) is another. Numbers attending such full-time virtual schools where customized lessons are the norm enroll a fraction of 1 percent of U.S. students. Researchers have yet to establish whether such schools have students who perform academically as well, better, or worse than students in traditional schools.

4 Silver, N. (2012). *The Signal and the Noise: Why So Many Predictions Fail—But Some Don't*. New York: Penguin Press, 122-138.

5 Other examples of extreme claims for virtual schools can be found at:

Lips, D. (2010, January 12). *How online learning is revolutionizing education and benefiting students*. Washington, DC: Heritage Foundation. Retrieved April 30, 2013, from http://www.heritage.org/research/reports/2010/01/how-online-learning-is-revolutionizing-k12-education-and-benefiting-students/.

See also work by prominent proponent of online instruction Tom Vander Ark:

Vander Ark, T. (2012, June 8). How digital learning is boosting achievement. *Getting Smart* blog. Retrieved June 8, 2012 at, from http://gettingsmart.com/blog/2012/06/how-digital-learning-is-boosting-achievement/.

6 For an example of a full-time state-sponsored online school, see Florida Virtual School at: http://www.flvs.net/Pages/default.aspx.

For an example of a non-profit full-time online school that pays a for-profit firm (K12 Inc.) a substantive portion of its revenues , see:

http://www.k12.com/agora/ and
http://seekingalpha.com/article/395771-k12-manifesting-its-corporate-destiny/.

7 The terms online learning and blended learning here refer to:

> [A] wide range of programs that use the Internet to provide instructional materials and facilitate interactions between teachers and students and in some cases among students as well. Online learning can be *fully online,* with all instruction taking place through the Internet, or online elements can be combined with face-to-face interactions in what is known as *blended learning* [original italics].

This definition comes from:

U.S. Department of Education (2012, January). Understanding the implications of online learning for educational productivity. Washington, DC: Office of Educational Technology, U.S. Department of Education, v.

Synonyms for online instruction, past and present, are "distance learning," "virtual learning," "cyberlearning," and "e-learning."

Blended learning, a combination of individual online instruction and whole or small group instruction in regular public school buildings has emerged recently in K-12, particularly in charter schools. Entrepreneurs, both for-profit and non-profit, and educators have developed various models of mixing online and direct classroom contact between teachers and students. See:

http://www.innosightinstitute.org/media-room/publications/education-publications/classifying-k-12-blended-learning/.

The use of "virtual learning" here refers to online courses, hybrid or blended schools and "flipped classes" (when teachers assign students videos or online presentations to do as homework and then use actual classroom time for discussions and analysis of those videos and online presentations).

8 For descriptions of different ways of teaching in K-12 online courses, see:

Watson, J. (2007, April). *A national primer on k-12 online learning*. Vienna, VA: North American Council for Online Learning, 10-15.

9 In New York City's pilot model of "The School of One," individual online lessons were created for students that were customized to their academic skill level in reading and math. See
http://schoolofone.org/concept.html/.

For elementary school English language learners, see "Rosetta Stone" and for math, "Buffalino." In 2012, Rocketship Learning Labs used both these at Las Suenos Elementary School in San Jose.

Fensterwald, J. (n.d.) Leaning labs 101 *Scholastic administrator* Retrieved April 30, 2013, from http://www.scholastic.com/browse/article.jsp?id=3757077/.

10 For a picture of what an award-winning online teacher does during the day, see a video on a typical day for Kristen Kipp—online teacher of 2011—at:
http://www.youtube.com/watch?feature=player_embedded&v=M8NpTDsScjg#!/.

11 Christensen, C., Johnson, C., & Horn, M. (2008). *Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns*. New York: McGraw Hill;

Wolpert-Gawron, H. (2011, April 28). Blended learning: combining face-to-face and online education. *Edutopia*. Retrieved April 30, 2013, from http://www.edutopia.org/blog/blended-online-learning-heather-wolpert-gawron/.

Susan Patrick *et al.* have this to say about the question of whether and how online learning benefits students:

> Online learning is becoming more common—but is it a better way for students to learn than traditional schools? In some ways the answer is clearly yes. Some students are, for example, taking Advanced Placement courses that they would otherwise not have access to if it was not for an online course. They are better prepared for college or career having had the option to take the online course. Students who attend an online school as a last resort because they have not succeeded in traditional schools, or students who are physically unable to attend traditional schools, are also clearly better off because of the online option.
>
> But what of the many other students who are choosing online schools when they might instead remain in the traditional classroom—is the online school a better option for them?
>
> The simplest answer to that question is we do not know, because most state accountability and data systems can't easily provide the information about individual student growth on mastery outcomes that is necessary to produce the answer (p. 3).

Patrick, S. *et al.* (2012, October). *Measuring quality from inputs to outcomes: Creating student learning performance metrics and quality assurance for online schools*. Vienna, VA: International Association for K-12 Online Learning.

12 Clark, R. (1983.) Reconsidering research on learning from media. *Review of Educational Research, 53*, 445-59;

Roblyer, M.D. (2007). A deconstructed example of a type 4 study: Research to monitor and report on common uses and shape desired directions. *Contemporary Issues in Technology and Teacher Education* [Online serial], *7*(1). Retrieved April 30, 2013, from http://www.citejournal.org/vol7/iss1/seminal/article1.cfm;

Patrick, S. *et al.* (2012, October). *Measuring quality from inputs to outcomes: Creating student learning performance metrics and quality assurance for online schools*. Vienna, VA: International Association for K-12 Online Learning.

13 Authors have not found research studies of "flipped classrooms" that are experimental or quasi-experimental in design. Still, educators and journalists have written extensively about this model, often in glowing terms. See:

Gerstein, J. (2011). The flipped classroom model: A full picture. *User Generated Education* blot. Retrieved April 30, 2013, from http://usergeneratededucation.wordpress.com/2011/06/13/the-flipped-classroom-model-a-full-picture/;

Toppo, G.(2011, October 7). Flipped classrooms take advantage of technology. *USA Today*. Retrieved April 30, 2013, from http://usatoday30.usatoday.com/news/education/story/2011-10-06/flipped-classrooms-virtual-teaching/50681482/1/.

14 See, for example:

NCREL and Metiri Group (2003). Engauge 21st century skills: literacy in the digital age. North Central Regional Educational Lab, 2003. Available at http://pict.sdsu.edu/engauge21st.pdf

15 Natale, C. (2011, July 15). *Teaching in the world of virtual k-12 learning* (report). Princeton, NJ: Educational Testing Service, 16-18;

Battaglino, T. *et. al.* (2012). The costs of online learning (Working Paper). Washington, DC: Thomas B. Fordham Institute, 6.

16 Author L. Cuban interviewed John Danner, CEO of Rocketship Schools, on January 30, 2012. Danner stated that he can save a half-million dollars a year in teacher salaries by hiring "Learning Lab" aides—parents and college students—to monitor and help students while they are going through software programs on individual computers in the "Learning Lab."

17 Cavanaugh, C. *et. al.* (2004). *The effects of distance education on k-12 student outcomes: a meta-analysis.* Faculty Research Paper, University of North Florida.

The most exhaustive meta-analysis was completed by Barbara Means, *et. al.*:

Means, B. *et. al.* (2010). *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies*. Washington, DC: Office of Planning, Evaluation, and Policy Development, U.S. Department of Education. Retrieved April 30, 2013, from http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf/.

Means cited the Cavanaugh study.

18 Means, B. *et. al.* (2010). *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies*. Washington, DC: Office of Planning, Evaluation, and Policy Development, U.S. Department of Education, xiv. Retrieved April 30, 2013, from http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf/.

19 Means, B. *et. al.* (2010). *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies*. Washington, DC: Office of Planning, Evaluation, and Policy Development, U.S. Department of Education, 54. Retrieved April 30, 2013, from http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf/.

20 Watson, J. (2007, April). *A national primer on k-12 online learning*. Vienna, VA: North American Council for Online Learning.

Watson worked for Evergreen Associates, another online instruction advocacy organization. Out of a 42-page document, just over one page dealt with effectiveness of virtual instruction citing two studies. One retrospective study, using no controls, compared the national rate of students passing Advancement Placement Exams in three virtual programs with the national pass rate. Virtual schools did better. The other study Watson cited and quoted was a meta-analysis that contained a paragraph that pointed out the dearth of studies and, while showing modest gains for virtual instruction over traditional lessons, said:

> this conclusion should be described as showing promise, but with the realization that we cannot have real 'confidence' in these conclusions until there is much more support available from high-quality quantitative research . (quoted in Watson, 2007, p.25).

See also:

Smith, R., Clark, T., & Blomeyer, R.L. (2005, November). *A synthesis of new research on K-12 online learning*. Naperville, IL: Learning Point Associates, 18.

21 See Watson, J. (2007, April). *A national primer on k-12 online learning*. Vienna, VA: North American Council for Online Learning, 24-25.

22 Burrus, R. *et. al.* (2007). Self-reports of student cheating: does a definition of cheating matter? *Journal of Economic Education*, *38*(1), 3-16;

Maxwell, N. & Lopus, J. (1994). The Lake Wobegon effect in student self-reported data. *The American Economic Review*, *84* (2), 01-205.

23 A randomized experimental design in a Maine school district where iPads were bought and deployed in a pilot program produced headlines and attention from both enthusiasts and skeptics. Five year-olds with iPads were supposedly scoring higher on certain tests than those peers without iPads. See:

Bebell, D. *et. al.* (2012, February). *Emerging results from the nation's first kindergarten implementation of ipads: Report to Auburn (ME) Board of Education*.

For analysis of the flawed findings, see :

Reich, J. (2012, March). What should we do with the Auburn kindergarten ipad findings? *Justin Reich* blog. Retrieved April 30, 2013, from http://www.edtechresearcher.com/2012/03/what-should-we-do-with-the-auburn-kindergarten-ipad-findings/.

24 Lips, D. (2010, January 12). *How online learning is revolutionizing education and benefiting students*. Washington, DC: Heritage Foundation. Retrieved April 30, 2013, from http://www.heritage.org/research/reports/2010/01/how-online-learning-is-revolutionizing-k12-education-and-benefiting-students/.

25 The study cited is

Means, B. *et. al.* (2010). *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies*. Washington, DC: Office of Planning, Evaluation, and Policy Development, U.S. Department of Education, xiv. Retrieved April 30, 2013, from http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf/.

26 Means, B. *et. al.* (2010). *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies*. Washington, DC: Office of Planning, Evaluation, and Policy Development, U.S. Department of Education, xv. Retrieved April 30, 2013, from http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf/.

27 The discussion on symbolism of technology in K-12 schools and in the larger culture is drawn from Henderson, K. (1998). *On Line and On Paper*, Chapter 8. Cambridge, MA: MIT Press;

Meyer, J. & Rowan, B. (1983) Institutional organizations: Formal structure as myth and ceremony, in Walter Powell and Paul DiMaggio (Eds.) *The New Institutionalism in Organizational Analysis*, 41-62. Chicago: University of Chicago Press;

Pfeffer, J. (1981).Management as symbolic action: The creation and maintenance of organizational paradigms. *Research in Organizational Behavior, 25,* (3), 1-52.

28 Perkins, I. (2007, February 22). Schools ask voters to fund tech push. *Detroit News*, 2B.

29 Hess, F. (1998) *Spinning wheels: The politics of urban school reform*. Washington, DC: Brookings Institution Press.

30 For preschool policy trends, see

Jacobsen, L. (2007, November). States moving to universal pre-k? *Education Reform* (Policy Brief, Education Writers Association).

Lerner S. (2012, December 4). Pre-K on the Range. *The American Prospect*.

For positive outcomes, see, for example, a study of Perry preschool program at http://www.highscope.org/content.asp?contentid=219;

And a study of Abecedarian schools in North Carolina at http://evidencebasedprograms.org/1366-2/abecedarian-project.

For an overview, see

Heckman, J. (2006, June 30). Skill formation and the economics of investing in disadvantaged children," *Science, 312*, 1900-1902.

For career academy trends, see

Kemple, J. (2008, June). Career Academies: Long-Term Impacts on labor market outcomes, educational attainment, and transitions to adulthood. New York: MDRC. Retrieved April 30,2013, from http://www.mdrc.org/career-academies-4.

See also:

Edutopia Staff (2010, September 27). Career and technical education: research roundup. *Edutopia.com*, which includes two articles by David Stern and Marisa Saunders and Erika Hamilton on the expansion of academies and the research policymakers used to justify spread of these programs. Retrieved April 30, 2013, from http://www.edutopia.org/stw-career-technical-education-research-roundup/.

31 See, for example,

Figlio, D., Rush, M., & Yin, L. (2010, May). Is it live or is it internet? *Experimental estimates of the effects of online instruction on student learning,* (Working Paper No. 16089). Cambridge, MA: National Bureau of Economic Research.

Such experimental/control designs are difficult to implement in K-12 settings for many reasons, primarily because children and youth are compelled to attend school and parental permission must be secured and treatments for some but not other children cannot be with-held. However, a number of researchers have overcome obstacles and carried off these kinds of studies. See :

Slavin, R. *et. al.* (2010, January). Effective reading programs for the elementary grades: A best evidence synthesis. Baltimore, MD: Best Evidence Encyclopedia (BEE), Johns Hopkins University School of Education, Center for Data-Driven Reform in Education. See: www.bestevidence.org

32 Amiel, T. & Reeves, T. (2008). Design-based research and educational technology: rethinking technology and the research agenda. *Educational Technology and Society, 11* (4), 29-40;.

Wang, F. & Hannafin, M. (2006). Design-based research and technology-enhanced learning environments. *Educational Technology Research and Development*, 53(4), 5-23.

33 See, for example, Brown, A. (1991). Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *The Journal of The Learning Sciences, 2*(2), 141-178.

34 Windschitl,M. & Sahl, K.(2002). Tracing teachers' use of technology in a laptop computer school: The interplay of teacher beliefs, social dynamics, and institutional culture. *American Educational Research Journal*, *39*(1), 165-205.

35 Warschauer, M. (2008).Laptops and literacy: A multi-site case study. *Pedagogies: An International Journa*l, *3,* 64.

*This is a section of **Virtual Schools in the U.S. 2013: Politics, Performance, Policy, and Research Evidence**, a research brief published by the National Education Policy Center, housed at the University of Colorado Boulder, and made possible in part by funding from the Great Lakes Center for Education Research and Practice. The entire brief, as a single document and in individual sections, is available at http://nepc.colorado.edu/publication/virtual-schools-annual-2013/.*

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