CHAPTER THREE

The Costs of Online Learning

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Online learning, in its many shapes and sizes, is quickly becoming a typical part of the classroom experience for many of our nation's K–12 students. As it grows, educators and policymakers across the country are beginning to ask the question: *What does online learning cost?* While the answer to this question is a key starting point, by itself it has limited value. Of course there are cheaper ways to teach students. The key question that will eventually have to be addressed is this: *Can online learning be better and less expensive?*

Ultimately, new technology-rich education models will need to be evaluated based on their productivity, that is, the results that they produce relative to the required investment. Unfortunately, within the nascent field of online learning, this information simply isn't yet available. While we embrace the need to understand and illuminate both costs and outcomes, our goal in this chapter is to explore the cost issue alone. We seek, to the extent possible, to compare the costs of digital education on various dimensions with the costs of traditional brick-and-mortar schooling in order to help lay the foundation for the ultimate lens on productivity.

This analysis is not straightforward, of course, because costs vary *within* digital education just as they do within brick-and-mortar schooling options. Educators and policymakers pursue online learning for different reasons and adopt different flavors of technology-rich models. Broadly speaking, today's policymakers and educators appear to pursue online-learning solutions for one or more of three primary reasons: to reduce overall costs (often in response to budget shortfalls); to increase the range of course offerings available to students (such as advanced or remedial classes or unusual subject areas); or, more radically, to use technology to rethink the traditional teaching-and-learning model (primarily reflecting a leader's instructional vision, but often linked to budgetary considerations). Of course, resource allocation varies significantly across these categories. Some models explicitly look for savings, while others aim to free up resources from one area for use elsewhere.

We therefore caution readers against looking for one simple "price tag" for online learning, or assuming that savings necessarily translate into a lower overall cost per pupil. For schools that deliberately use technology to reduce costs in one category in order to free up resources to invest elsewhere, the "savings" are often an important component of the school's overall resource-allocation strategy. Still, current and future economic pressures could require both traditional brick-and-mortar and online schools to cut costs (or keep costs neutral) relative to today's per-pupil funding levels; this is possible, but further innovation in the field is required to ensure that robust student outcomes are not marginalized in the process.

With these important caveats in place, we explore the costs and resource-allocation strategies that have emerged in today's online-learning landscape. We present average cost figures for both virtual and blended models (for definitions, see "Types of Models," below). Our goal is to articulate the size and range of the critical cost drivers for online schools versus those for traditional brick-and-mortar schools, in order to understand how cost categories have the potential to change when technology is used in the classroom. The information presented here results from interviews with more than fifty entrepreneurs, policy experts, and school leaders. These interviews informed the set of estimates regarding the cost of virtual and blended schools across a number of categories. As is always the case in a nascent, ever-changing field, the figures for online learning are not definitive but represent at most a helpful starting point.

Before diving into the discussion of cost, it is worth sharing a few observations about the historic productivity of education technology. Long before our latest wave of online learning and digital innovations, school districts spent enormous sums to equip classrooms with televisions, personal computers, laser-disc systems, VCRs, and more. Decades and billions of dollars later, it is difficult to point to any evidence suggesting that technology has impacted student achievement, graduation rates, or other outcome measures. By contrast, while public education reform has remained frustratingly stagnant, technology has been arguably the major driving force of productivity improvement in many other parts of our economy. From investment banks to grocery stores to travel agencies, big and small businesses have used technology to accomplish more with less.

Why has technology had so little impact on our nation's public schools? Technology has been used predominantly to supplement the traditional model—a row of computers in the back of a classroom, or a smart board at the front. (For existing schools, the time and costs required to transition to the use of technology as anything but an add-on are often too difficult.) Meanwhile, the fundamental classroom structure (one teacher standing in front of a group of students) has remained the same for the past fifty-plus years. Given the lack of improved student outcomes, the addition of technology to classrooms has translated to the same output at greater cost—in other words, reduced productivity. In economics, this is known as Baumol's Disease: Too often, labor-intensive organizations increase expenses without improving productivity.[1]

As noted above, our hope is that any investment in classroom technology leads to an increase in student outcomes. The limited availability of reliable and consistent cost and outcomes data prevents robust conversations related to productivity. Particularly for those entrepreneurs who aim to use technology to rethink the classroom, an interesting debate has emerged in the field as to whether bold new models must demonstrate that they are at least cost neutral at their inception. One camp contends that cost pressures are what will ultimately drive wider-scale adoption, and so new models *must* be cheaper from day one. Others argue that the degree of innovation taking place in some classrooms today requires a temporary respite from focusing on cost. This approach seeks solutions designed to address the needs of students and teachers, with the business model left to be revisited once the appropriate solutions have been identified. Given current market dynamics and investments by philanthropic organizations, we will likely continue to see a range of innovation that includes both cost-neutral and resource-intensive solutions. We will likely also see some innovations accompanied by lower net costs. This variation is healthy for the field. Costs and resource allocation must continue to be an active topic for conversation as innovation and evaluation unfold.

Types of Models

A decade ago, the majority of online learning was 100 percent virtual in nature—i.e., carried out entirely outside of brick-and-mortar schools. Yet today, a wide range of online models currently exists. (In a recent report, authors Michael Horn and Heather Staker profile forty-eight unique approaches.[2]) For the purposes of examining costs, we will focus on two broad categories: virtual and blended.

Virtual

In virtual schools (examples include Florida Virtual, K12 Inc., and Connections Academy), all instruction takes place online. Students still interact with live teachers, listen to lectures, work on homework, ask questions, and more, but all activities occur at a distance, with interactions facilitated by technology.

Virtual options currently serve both full- and part-time students. The former often either (a) have significant travel schedules or other constraints on their ability to engage fully with in-classroom learning on a regular basis, or (b) are frustrated (for whatever reason) with their neighborhood schools. The part-time students often take one or more courses online to supplement the offerings available through their local brick-and-mortar schools; many schools, particularly smaller schools and those in rural areas, struggle to provide students with a wide range of course options (e.g., advanced or remedial courses not already offered, or specialized course topics). Although predominantly purchased by schools on behalf of their students, online instruction can be and is purchased by other agencies as well (e.g., prisons, hospitals, day-care centers, and military bases).

> *Example:* Florida Virtual School (FLVS) is the nation's first statewide, online public high school and currently offers options across all grade levels for both full-time and part-time students. Instruction takes place online; students select their courses and then complete assignments, quizzes, and tests at their own pace. Homeschooled students in and out of Florida can take online courses; Florida Virtual has also partnered with many school districts nationwide to provide online supplemental options for students. The school, for instance, offers more than a dozen online AP courses for high school juniors and seniors.

Blended

In blended schools, by comparison, students attend brick-and-mortar schools where they alternate between online and in-person instruction. (Examples include Carpe Diem, KIPP Empower LA, and Rocketship Education.) In many of these schools, educators regard technology as a tool used to personalize instruction that is integrated into the overall school model. In theory, though still in the early stages, technology can help to provide a range of content and modalities for each student depending upon his or her academic strengths, prior achievement, areas for development, interests, and learning styles. We examine two main types of blended models, *rotational* and *flex*.

Under the *rotational* model, students in some blended schools spend a specific amount of time (typically one or two periods a day) participating in online learning. The online-learning sessions are a defined portion of each school day, and students receive technology-enabled personalized instruction within those blocks of time.

> *Example:* Rocketship Education is a California-based charter school network focused on parent empowerment, teacher development, and individualized learning. Rocketship combines traditional classroom teaching with individualized instruction through its "Learning Lab," in which students spend one-on-one time on computers utilizing adaptive educational programs and receive instruction in intensive tutor-led small groups to master basic reading and math skills. The Rocketship model generates approximately $500,000 annually in cost savings per school of 450 students, which can then be reallocated toward higher teacher salaries and professional development, among other things. Additionally, as a result of these cost savings, Rocketship schools are able to operate sustainably on traditional public school funding and without additional philanthropic funds.

Under the *flex* model, blended schools utilize a "workplace model," where students follow their own path online, checking in with an instructor when they have questions. The amount and nature of the time spent online varies by student and by day—and sometimes even by hour. The level of technology-enabled personalized instruction is driven by students' needs on any particular topic or day and is thus less predictable, so these models are often referred to as "flex" models.

> *Example:* At Flex Academy, a full-time California-based blended school using the K12 Inc. curriculum, the educator-to-student ratio is about one to twenty-five (with a credentialed teacher-to-student ratio of approximately one to forty-two), but class size is typically five to eight students. Students often pursue online learning or work on projects with supervision by paraprofessionals, and spend only a portion of their time participating in face-to-face classes with credentialed teachers. Students progress through online curricula at their own pace, complete hands-on projects and science labs, and connect one-on-one or in small groups with instructors when they need specific concepts explained or when the teachers want to engage or inspire the students with a certain educational activity. Flex Academy parlays its labor-cost savings into more spending on curriculum and technology.

Resource-allocation Cost Categories

Historically, public school districts have had relatively little budget flexibility, because so much of their budgets is tied into multiyear contracts, tenured staff, and other fixed obligations. Recently, however, innovative technology-rich school models have begun to experiment with new ways to repurpose limited dollars. Many of these innovators are charter schools or vendors to traditional schools, which have the flexibility to pursue options unavailable to many traditional district schools.

While we frame such cost changes as “savings” below, many entrepreneurs in the field view online learning as an opportunity for reallocation of resources away from an existing category and toward a new strategy aligned with the school’s overall vision, which may or may not yield net savings in the end. Rocketship Education, for instance, “saves” about $500,000 per school of 450 students per year by decreasing teacher and facilities costs relative to traditional elementary schools through its online Learning Lab. But as part of its model, the organization reinvests this money in talent development, academic deans, response to intervention, higher teacher salaries, and future scaling. Other virtual or blended schools have experimented with reallocating savings toward lowering student-teacher ratios, improving school facilities, and more.

Figure 3.1 outlines the variation in online-learning models. The average per-pupil figure of approximately $10,000, not including central administrative costs, combines all public school types (elementary, middle, and high school) across the United States, without regard to district or state variations.[3] The virtual-school number represents an estimate for full-time high school students. The blended figure represents middle school students, as some of the most promising blended models are middle schools. Additionally, as scale can be a critical factor in determining ongoing costs, our cost numbers reflect schools with enrollments of approximately five hundred full-time equivalent students.

As is evident in figure 3.1, the traditional school model spends over half of its budget on labor, with the majority of the remainder allocated to school operations. Content and technology costs combined are a tiny fraction of overall costs. A blended model, by comparison, has the potential to save approximately $1,100 per student (11 percent). By significantly reducing school-operations costs, a virtual school can potentially save approximately $3,600 per student, a savings of more than a third over a traditional school. These cost estimates reflect the current variation in the field. They are not a guarantee of quality, given insufficient data on student outcomes associated with the range of models.

One important note: For online and blended students, costs are sometimes reallocated in different ways that do not mean savings from an overall systems standpoint. A virtual school, for instance, may not charge for certain services (i.e., special education services) that are provided by the home district. This does not represent savings from a system level; it simply means that costs are divided between the virtual school and a student's home district.

The cost figures outlined in figure 3.1 represent estimates gathered from available public documents and conversations with experts and vendors within the field. A wide variety of funding levels exists within online learning; for example, research on virtual-school funding reveals that virtual schools are operating on funding levels that range from below $4,000 per student to above $9,000 per student. Given this fluctuation, we also provide an estimate for variation within each figure (although outlier models at both the high and low ends do not necessarily fall within these bands).

Note once more that these figures outline current cost estimates within the field, as opposed to ideal or recommended expenditures. They do not speak to school quality or student outcomes, and are simply meant to provide a framework

Figure 3.1: Estimated Per-Pupil Expenditures

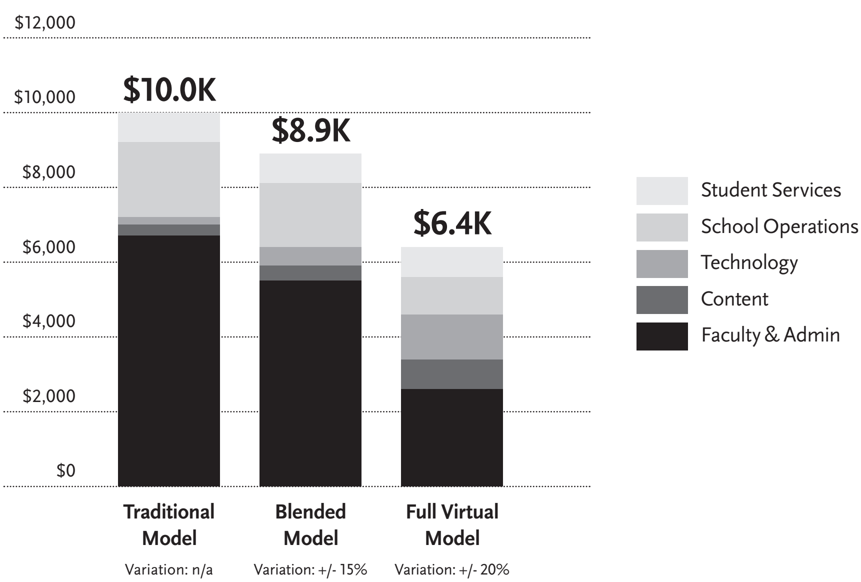

Table 3.1: Cost Bands for Virtual- and Blended-School Models

A. VIRTUAL MODEL			
Category	Cost estimate	Fluctuation	Cost levers
Labor (teachers and administrators)	$2,600	+/- 15%	▪ *Student-teacher ratio* ▪ *Teacher salary* ▪ *Professional-development delivery (virtual or in-person)*
Content acquisition	$800	+/- 50%	▪ *Content quality (level of personalization)* ▪ *Inclusion of content-management system*
Technology and infrastructure	$1,200	+/- 25%	▪ *Computer purchases or Internet subsidies for students* ▪ *Additional instructional hardware (i.e., webcam) for teachers*
School operations	$1,000	+/- 20%	▪ *Facility size (determined by whether teachers work remotely)* ▪ *Transportation (field trips and state testing)*
Student support	$800	+/- 0%	▪ *May potentially change depending on student mix, but a critical component of all schools*
Total	$6,400	$5,100–$7,700	

B. BLENDED MODEL			
Category	Cost estimate	Fluctuation	Cost levers
Labor (teachers and administrators)	$5,500	+/- 15%	▪ *Time spent in computer-facilitated learning* ▪ *Human capital during computer-facilitated learning* ▪ *Human capital model for remainder of school day*
Content acquisition	$400	+/- 50%	▪ *Content quality (level of personalization)* ▪ *Inclusion of content-management system*
Technology and infrastructure	$500	+/- 20%	▪ *Student-laptop ratio* ▪ *Wireless needs*
School operations	$1,700	+/- 5%	▪ *Potential small cost savings around facilities and transportation from staggering student schedules*
Student support	$800	+/- 0%	▪ *May potentially change depending on student mix, but a critical component of all schools*
Total	$8,900	$7,600–$10,200	

for important resource-allocation decisions at blended and virtual schools. Note, too, that state funding levels often drive the cost base for online learning; the ability and willingness of states to fund online learning sets the baseline for online costs. In this analysis, we attempt to separate costs and funding as much as possible.

The next few pages outline the five primary cost-driving categories that differentiate schools' resource-allocation strategies: labor, content acquisition, technology and infrastructure, school operations, and student-support services. Within each category, certain expenses are nonnegotiable, while others have the potential to be cost-savings levers. Table 3.1 outlines the important key cost considerations for each category (and is subject to the same caveats and conditions as noted above for figure 3.1).

Cost Driver 1: Labor

Labor (which typically makes up well over half of district budgets) represents the largest opportunity to rethink resource allocation and seek possible "savings." Not surprisingly, online schools vary widely in terms of human-capital structure, including student-teacher ratios, salaries, and more. At its most basic level, calculating labor costs per pupil is a simple equation with two variables: the number of instructors and the average costs associated with those instructors (recognizing that these may vary at different points in the school day). Reducing labor costs through the use of technology necessarily involves either decreasing the student-instructor ratio or reducing average instructor payout, typically by modifying the overall instructor mix—that is, combining the use of traditional teachers with other instructors such as paraprofessionals or aides.

Two related costs that are often overlooked in blended and virtual schools are professional development and IT costs. Training is a critical component for online schools, as most teachers (and other staff) must learn new skills that allow them to be effective within a new school model. Additionally, virtual-school and blended-school models often require additional IT support—and many such schools employ one or more IT support staffers.

Labor in the Virtual Model

As table 3.1 (on page 62) indicates, an average estimate for labor costs in the virtual model is $2,600 per student, with potential variation of about 15 percent in either direction. Along this range are virtual schools with labor models relatively similar to those of traditional schools as well as virtual schools with models that significantly reduce labor costs. Among the former are virtual schools that maintain a ratio of one teacher to twenty-five students (similar to traditional districts) and pay virtual teachers according to the same pay schedules as teachers in brick-and-mortar schools, resulting in similar labor costs. At times, the decision to invest in comparable levels of instructional expenditures has been driven by statewide collective-bargaining agreements (required by state law) and at other times by school leaders' instructional vision (which could reflect a commitment to typical student-teacher ratios or varied approaches to staffing levels and structures).[4]

On the other end of the cost spectrum, virtual schools with lower labor costs typically either (a) increase student-teacher ratios, or (b) reduce teacher salaries by transitioning to a part-time or paraprofessional workforce. It is interesting to note that student-teacher ratios at virtual elementary schools are often significantly higher than at virtual middle schools or high schools that have additional support expenses such as guidance counselors and others. Elementary schools also often require that a parent or someone else play the role of a live "coach" who assists the virtual teacher. The cost of the parent "coach" is not included in the cost estimates for the elementary school alternatives, which is why we have focused our analysis on middle school blended models and high school full-time virtual models. As an additional cost-saving measure, online schools may resort to virtual professional instruction (i.e., professional development using a webcam and online forums), in this way saving money on teacher training and facilities.

Although these costs are often overlooked, virtual schools typically have a principal and other administrative supports. A virtual school may potentially see some administrative savings by eliminating an assistant principal position (for example), but the addition of necessary IT staff often cancels out any potential savings.

We observe some correlation between lower-cost labor models and lower overall per-pupil funding, but also see different labor models in schools operating within the same states with the same funding levels. Thus external factors explain some, but not all, of the variation in labor models.

Labor in the Blended Model

The blended-learning model typically has smaller labor savings than the virtual model, as blended schools inevitably have labor needs (i.e., lunch duty, detention) that virtual schools do not have. These blended schools are also unlikely to experience any cost savings in terms of reduced administrative expenses. An estimate for blended-school labor costs is $5,500 per student, again fluctuating by approximately 10 to 15 percent on either end. Three drivers dictate labor costs at blended schools: time spent by students in computer-facilitated learning, the type of staff employed to supervise this computer-facilitated learning, and instructional staffing models for the remainder of the day:

- *Time spent in computer-facilitated learning.* Blended models vary dramatically in the percentage of the school day that students spend online. At schools like AdvancePath or Flex Academy that use a flex model, students spend the majority of their time online (or working on independent projects); those attending schools like KIPP Empower that use a rotational model spend only a period or two online daily.
- *Human capital during computer-facilitated learning.* Some school models have realized savings by employing lower-cost staff to monitor and support students while they use computers. At New York City's School of One, for instance, student-teachers or paraprofessionals (with lower average salaries) supervise online lessons, while certified teachers are used to deliver live instruction.
- *Human capital for the remainder of the day.* For many blended schools, the school day beyond the online portion is unchanged. However, some blended models have chosen to rethink the remainder of the day, often by repurposing funds that have been made available by lower-cost online portions of the day. For instance, some schools have significantly lower class size; others have moved to a longer school day.

Cost Driver 2: Content Acquisition and Development

Content costs in a traditional brick-and-mortar school are relatively small compared to total per-pupil spending; some districts spend less than $200 per student on instructional materials. However, the very definition of the word *content* changes significantly for virtual and blended schools. In a traditional school setting, content typically refers to the supporting materials used by teachers for face-to-face instruction: textbooks, workbooks, manipulatives, videos, instructional games, and more.

Online schools, by comparison, spend content dollars on tools that traditional schools typically do not use, such as data integration/management tools—which are often sophisticated (and expensive). Not surprisingly, costs in this category can vary tremendously. Some online schools spend even less on content than traditional schools, utilizing mostly open-source and teacher-created materials. Alternatively, other models have opted to spend millions of dollars on content development in order to produce unique, proprietary learning-management systems that are often used across multiple schools. There are three primary types of content, each used to differing degrees by full-time virtual programs and blended programs.

- *Open-source/teacher-created content.* This option is typically the least resource intensive; content is either posted online free of charge (e.g., web videos from Khan Academy) or developed by teachers who are paid a small fee. A free content-management system (e.g., Moodle) can be used to integrate teacher-created content. Although schools can minimize or reduce expenditures on content through this option, they may invest more in labor to manage and maintain these homegrown systems. These labor costs are often understated because they use existing staff time, but the opportunity costs associated with these efforts can be significant and should be considered.
- *Off-the-shelf online content.* Purchasing content requires expenditures on individual courses or bundles of courses. For online content, the major distinction is whether the course comes with a virtual instructor to assist students. Course pricing is typically about $75 per course without instructors, compared to between about $200 and $400 with instructors. (This is calculated per semester-long course, though courses can be bundled and/or priced on a per-seat basis as well.) The price of courses without instructors continues to decline; once developed, these courses can be delivered to almost any school for minimal cost and can be recycled over time. Courses with instructors, by comparison, appear to have more stable (and recurrent) costs, as scale does not materially impact the human-capital costs.
- *Large-scale development of content.* At costs of millions of dollars (both public and private), some districts, states, and school operators have chosen to hire large content-development teams to create courseware, proprietary learning-management systems, and more. Given the significant levels of up-front investment required, content development can make sense to the extent

that a district, state, or school operator expects to achieve significant scale of enrollments and to amortize the costs over time. (Our ongoing cost estimates consider only school content purchases; for more on the issue of "build versus buy," see the "Start-up, Size, and Scale" section below.)

Content Acquisition in the Virtual Model

Many full-time virtual schools choose one of the latter two options listed above, either purchasing off-the-shelf content or investing in large-scale development. We estimate that content costs for virtual schools average approximately $800 per FTE student, but these fluctuate significantly. Included in this estimate is the cost of courseware, a content-management system, and students' materials (this cost includes purchase and shipping). Our estimates (visible in table 3.1 on page 62) reflect a school that has chosen to purchase content rather than develop its own—which is increasingly common for virtual schools given the rise of the Common Core standards and wide variety of online-content vendors offering courseware to virtual schools. Given that labor costs are already included in our model, we also assume that the virtual school has chosen to purchase content offerings that do not provide access to an instructor, as virtual schools typically employ their own teachers. Although an individual course may cost about $75 per student, offerings for full-time virtual schools are typically priced on a per-seat (as opposed to per-course) basis, and access to a full suite of courses can cost as little as $200 per student.

Even for schools that purchase off-the-shelf content, however, price varies depending on the complexity of the product and level of services provided. More-expensive courses are often highly personalized; individual students receive different content in order to meet their learning needs more directly. For instance, for some content, results of student performance on integrated tests and quizzes fully or partially determine the content students receive. These vendors will also often mail students a range of physical materials, including textbooks and science equipment for experiments, as opposed to providing them with electronic materials.

Content Acquisition in the Blended Model

As at virtual schools, the cost of content at blended schools includes courseware, a content-management system, and student materials. Electronic or online content costs at blended schools are often lower than at virtual schools, however, simply because students spend less time engaged with online courseware. For blended schools, we estimate a content cost of $400 per student (fluctuating by 50 percent), which assumes that a school purchases off-the-shelf products (this would be in addition to the cost of content for the off-line portion of the day). A handful of blended schools have chosen to develop their own online courses from a variety of open-source content, which drives down the cost of content. For instance, eC-ADEMY, a districtwide program within the Albuquerque Public Schools system, represents a low-cost approach; the school pays its teachers a small fee to develop their own courses. With the increase in open-source content, and a variety of free online options, some schools choose to reallocate content dollars to other areas.

One important cost trade-off (in terms of both labor and content) for a blended school is the amount of time that students spend online. More online time generally means fewer teachers, but also requires robust (and often relatively expensive) content to substitute for reduced teacher time. Typically, the shift toward more online instruction tends to produce net savings for the school, as reduced labor costs outweigh increased content costs.

Cost Driver 3: Technology and Infrastructure

Technology, often a minimal portion of a traditional school's budget (about $200 per pupil) is a far more significant expense for online schools. Infrastructure is often a critical roadblock as traditional brick-and-mortar school systems look to integrate blended and virtual options. For a traditional school looking to transition to blended learning, the key question is what infrastructure (i.e., hardware, software, connectivity) already exists. The answer could mean a difference in hundreds of thousands of dollars.

Technology in the Virtual Model

Technology costs have the potential to be a large portion of a virtual school's costs, with an average estimate of $1,200 per student. Regardless of the virtual-school model, schools must pay for teacher instructional devices (i.e., computers or tablets); infrastructure (i.e., connectivity, storage, and servers), which are often outsourced to vendors; and maintenance. Virtual schools may opt for additional expenses either to (a) offer their students instructional devices (each his or her own computer or tablet), as well as Internet connectivity subsidies; or (b) offer teachers additional teaching aids, such as webcams or document cameras.

Technology in the Blended Model

Technology is not necessarily a large cost for a blended school, with an average of $500 per student. Like virtual schools, however, blended schools must pay for teacher hardware, infrastructure, and maintenance. Some rotational blended schools do not need to pay more for technology than a traditional school with a robust computer lab. On the other hand, models like those used by Flex Academy or School of One demand a one-to-one student-to-computer ratio and wireless connectivity throughout the school building.

Cost Driver 4: School Operations

From transportation to custodians to food services, traditional schools spend significant amounts of money (typically about 15 to 25 percent of total budgets) on noninstructional operations. In some cases, virtual and blended schools have managed to reduce these costs to almost nothing; in other cases, they actually pay more within these categories.

School Operations in the Virtual Model

Virtual schools typically spend far less on school operations ($1,000 per student) than an average traditional school, and some less resource-intensive models have found ways to reduce these figures further. Virtual schools experience savings on custodians and food-service employees, but they do incur some operational costs. Virtual schools also have facilities costs; in most states, they are required to have a physical location for school administration and staff. Some virtual schools require teachers to work from a central location, while others allow them to work from home—a decision that obviously has implications for facilities costs borne by the taxpayer. And some resource-intensive virtual schools spend money on field trips, student get-togethers, and related transportation expenses.

School Operations in the Blended Model

In theory, blended schools have the potential to save money on both facilities and transportation, but few schools have begun to realize this potential. As a result, our cost estimate of $1,700 per student is only slightly lower than the average at traditional schools. A system of staggered student schedules could potentially reduce the needed building size or the number of students requiring transportation on a daily basis—although facilities and busing are typically managed at the district level, sometimes even for charter schools. Rocketship Education and

Carpe Diem are two of the pioneers in this area and have actually sought and/or built smaller facilities as a result of the online options they provide students.

Cost Driver 5: Student-support Services

Guidance counselors, special education teachers, and other student-support services (which typically cost up to about $800 per student in a traditional setting) cannot be ignored when considering the costs of online learning. At blended schools, these additional costs (mostly labor) are more easily aligned to the regular school day. At virtual schools, these support services can be significant expenses that require in-person visits.

Student-support Services in the Virtual Model

Student-support services are often overlooked in virtual-school cost models, but they can be a significant expense when factoring in the appropriate support ratios (counselors or teachers to students) and the associated travel costs for live support. Guidance counselors and special education teachers have a critical role within all schools (online and otherwise). Some virtual schools have sought to reduce expenses by combining roles (i.e., principals or teachers playing guidance roles as well), though limited data are available on the efficacy of the various models. The cost estimate we provide for virtual-school student supports is similar to the average for a traditional school, at roughly $800 per student per year, although it certainly varies depending on the student populations served. In reality, although many virtual schools provide student-support services at lower cost, this figure is representative of school models that are investing in meaningful levels of student supports to ensure the development of the entire student. We expect to observe continued innovation in the area of student supports in the short and long term.

Student-support Services in the Blended Model

Student-support services at blended schools are also likely to cost about the same as traditional support. We have assumed an estimate of approximately $800 per pupil, similar to the virtual-school costs described above. Blended-school models often find innovative ways to reallocate resources, but given the current state of the field, we have not assumed a reduction in student-support services. Again, this is an area where we expect to see ongoing innovation.

Start-up, Size, and Scale

Start-up costs are a critical component of virtual- and blended-school development—as of any major innovation in education (and other fields). Online learning offers new resource-allocation possibilities in the long term, but it is accompanied by a number of unique start-up costs, including content development and acquisition, hardware, software, storage, servers, and more. For a state or district looking to price out a new virtual or blended school, the costs associated with online learning before a single student enrolls can easily reach the millions.

Policymakers and school operators have three options in tackling start-up costs for virtual schools: (a) purchasing a complete turnkey solution from an outside provider (resulting in limited start-up costs incurred by the state or district and ongoing expenditures with one or more external vendor); (b) purchasing content, servers, and other products à la carte from outside vendors (some start-up costs and required ongoing vendor support); or (c) developing an entirely homegrown solution including content (high start-up costs incurred by the state or district, investment in internal capacity required to sustain operations on an ongoing basis). States and districts looking to develop an online school have to answer this ultimate "build versus buy" question: Should they spend millions in start-up costs tailoring a product to individual needs, or build on the experience and research of an established vendor? Ultimately, the build-versus-buy question hinges on two things: the vision for scale and the need for customization. States and districts that build their own online offering typically either expect sufficient enrollment to cover initial investments or are working to develop an innovative or customized model not currently offered by outside providers.

It is important to remember, though, that start-up costs don't have to be a barrier to developing online-school models. Today, states, districts, and school operators can benefit from organizations that have already developed effective models. In states such as Georgia, Wisconsin, and Pennsylvania, outside providers have set up virtual schools, bearing almost all up-front costs, in exchange for per-pupil funding typically between $5,000 and $7,000 (which includes a management fee of about 10 to 15 percent). In this arrangement, an outside vendor incurs the start-up costs and recoups the investment over time, reflected in higher annual operating costs for the state or district.

Aside from facilities (which are a significant start-up cost for blended schools), the initial costs for virtual and blended schools are reasonably similar. Course development and technology (hardware, connectivity, servers, etc.) are two large cost buckets, but both can be acquired through leases from outside providers for an annual fee. Adequate planning time for the principal and school-leadership team is another critical investment for blended, virtual, and traditional schools. Often overlooked, professional development can also be a substantial additional cost for virtual and blended schools. Most traditional teacher training and preparation is geared toward traditional models of instruction, and retraining teachers (and rethinking instructor roles) is a new area that many schools are just beginning to tackle. Finally, recruiting and marketing to students, as well as community outreach, are often significant concerns for new, innovative school models that might potentially face skepticism from parents.

One important note: Almost all new virtual and blended schools to date have been start-ups; very few schools have attempted to convert from a traditional school to either a virtual or a blended model, although some exceptions do exist. For many schools, the barriers of converting are partially financial, but also cultural. A switch to a blended-learning (or virtual-learning) model requires expectation-setting and training for both students and teachers as they transition to a new mind-set and new roles.

Additionally, in virtual/blended education—as in any major innovation—there are "regulatory costs," i.e., add-on costs of complying with various rules and conditions and constraints. Whether fire-code regulations for a new blended-school building or a requirement limiting enrollment in a virtual school to residents of a single district, these regulatory costs must also be factored into any business model for online schools.

The Future of Online-learning Costs

Amidst the excitement and promise of new virtual- and blended-school models, it is easy to lose sight of the fact that online learning is an immature, still-developing sector. No discussion of the economics of online learning is complete without acknowledgment of the changes the field has experienced over the past decade—and the changes that are undoubtedly on the way over the next decade and beyond.

Growing supply (the number and capacity of vendors offering tools and services) plus increasing demand (willingness of states, districts, policymakers, students, and parents to experiment with new school models) suggests that online learning will continue to accelerate and new models will continue to proliferate. Interviews with states, districts, entrepreneurs, and vendors revealed a wide range of possibilities for the future of online-learning costs. This section considers the future of our first two cost drivers, labor and content acquisition.

The Future of Labor Costs

The next decade will undoubtedly continue to encourage the redefinition of the teacher's role, a topic discussed briefly here and more fully explored in the first chapter of this volume. Traditional classroom teachers face extraordinary challenges—often a thirty-to-one student-teacher ratio and students with varying educational needs, interests, and learning styles in the same classroom. Teaching is multiple jobs rolled into one; schools of the future will likely continue to search for ways that technology can ease this challenge while boosting instructional effectiveness. Many entrepreneurs are beginning to break down the various elements of a teacher's day and look for points of opportunity for technology to take over certain of these components, freeing up teacher time to focus elsewhere, such as on direct student instruction.

How will technology redefine the role of teacher? First, online learning can redefine who can become a teacher and the range of potential roles for adults who support student learning. Traditional school environments require teachers who can work full time in a prescribed setting. Online learning provides teachers with flexibility regarding where and how long they work, which in turn creates the potential for flexible hours and salaries for teachers based on experience, interests, and expertise. And as technology disaggregates the role of the teacher, opportunities may arise for teachers with different levels of experience, training, and skill to take on different roles, with the possibility to differentiate teacher compensation based on those factors and teachers' relative importance in the school.

Second, online learning will likely continue to increase the amount of individual attention that teachers can provide to their students. Today's teachers must spend time planning content (and differentiation strategies) for the next school day, identifying individual needs, grading student assessments, and otherwise preparing for class. Online learning, however, has the potential to do some of that work for teachers, allowing teachers to spend more time spent with students.

Finally, online learning has the potential to redefine professional development for teachers. In theory, online learning requires many different types of instructional roles and should enable teachers to progress at different paces and take on different levels of responsibility (e.g., teaching virtually, in-person, or for small or large groups). The data generated by online learning will provide a wealth of information that can be used to tailor professional development to the unique needs of individual teachers. Just as online learning can personalize instruction for students, digitally enabled professional development has the potential to do the same for teacher growth and learning.

The Future of Content Acquisition

For the past several decades, three large publishers have provided the nation's public schools with almost 80 percent of all traditional basal textbooks. The size of each of these firms offers them significant economies of scale in content development, sales distribution, and more.

Three key changes may potentially shift these market dynamics. First is a nascent but increasing trend toward decentralization, which is a result of the charter school movement and the rise of weighted student funding and technology-based content. A growing number of schools are gaining independence to make their own content-acquisition decisions. Second, electronic content has begun to make it possible for smaller companies to compete. Updating a textbook is a complicated, costly, multiyear affair, but the introduction of electronic content has the potential to make this process simpler, faster, and less resource intensive. Finally, the Common Core State Standards Initiative is expected to reduce barriers of entry even further, as less state-by-state customization will be necessary.

What will be the combined effect of these three changes moving forward? Content is increasingly becoming a commodity. As one interviewee explained, "If you can buy B-minus content for free, and B-plus content for very little, who's going to be willing to shell out for A-plus content?" As more players enter the market at a variety of price points, content-acquisition costs will almost certainly go down. An inevitable question then arises: How can schools effectively manage quality?

One potential solution for virtual and blended models is using modular content and analyzing student outcomes broken down to the individual-lesson level. Programs like Florida Virtual School and School of One have even begun to experiment with the concept of paying vendors based on student-skill acquisition (i.e., vendors get paid according to the number of students who can prove they have learned specific skills). The potential consequence is a new accountability system for vendors, and a cost-effective way for schools and districts to gauge the quality of new and existing products. Frederick Hess's discussion of quality control in the previous chapter of this volume explores this concept further.

Conclusion

The promise of online learning is twofold: More-effective uses of technology have the potential both to improve student outcomes and to create a more productive educational system. This chapter has worked out the current costs of both virtual and blended models—and has articulated where policymakers must ensure there are no barriers to innovation. It has not, however, systematically tackled the question of productivity (i.e., how to improve and maximize student achievement while keeping costs down). The focus on productivity is accompanied by multiple challenges. The first is today's dearth of high-quality data. Absent broadly accepted measures of student achievement (the "output" side of the productivity equation), calculating productivity is extremely difficult. Emerging policies—such as state and federal accountability statutes outlining universal reporting requirements around school finances, student achievement, and system performance—have the potential to lead to a greater focus on overall productivity.

A second challenge is the fundamental design of our K–12 delivery system. The near-monopoly enjoyed by most public school districts means that few districts are prodded to seek out and adopt higher-productivity solutions. Even hard-working and well-intentioned district officials rarely have the means available to them, or the associated flexibility, to reallocate resources to school models and vendors according to productivity. A private, for-profit company must deliver results and have a sustainable business model to compete, or risk going out of business.

We hope that in addition to outlining potential resource-allocation strategies for state and district policymakers and online-school operators, this chapter will encourage a focus on better outcome data to help identify the most productive and effective school models. Highlighting productivity is undoubtedly the first step toward rewarding productivity.

Endnotes

1. Paul Hill and Marguerite Roza, *Curing Baumol's Disease: In Search of Productivity Gains in K–12 Schooling* (Seattle, WA: Center on Reinventing Public Education, July 2010), http://www.crpe.org/cs/crpe/view/csr_pubs/343.

2. Michael B. Horn and Heather Staker, *The Rise of K-12 Blended Learning* (Mountain View, CA: Innosight Institute, January 2011), http://www.innosightinstitute.org/media-room/publications/education-publications/the-rise-of-k-12-blended-learning/.

3. U.S. Census Bureau, *Public Education Finances: 2009* (Washington, D.C.: U.S. Census Bureau, May 2011), http://www2.census.gov/govs/school/09f33pub.pdf; and National Center for Education Statistics, *Digest of Education Statistics, 2010* (Washington, D.C.: National Center for Education Statistics, 2011), http://nces.ed.gov/pubs2011/2011015.pdf.

4. For more on how the current school-governance arrangement affects virtual schools, see chapter five, “Overcoming the Governance Challenge in K–12 Online Learning,” by John Chubb.