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POLICY BRIEF

A Review of Digital and Online Learning in Private Schools and Public Charter Schools

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Director, Center for Education

November 2013

Key Findings

1. *Innovative leaders in education are using new digital learning tools and methods to enhance the capacity of teachers to help individual students learn.*
2. *Charter schools allow educators to transform their schools with new digital learning tools and methods.*
3. *Students in these schools spend part of the day learning from a computer or online program and the rest of the day learning from a teacher, known as "blended learning."*
4. *Washington's new charter school law allows educators the flexibility they need to adopt these new blended digital learning techniques.*
5. *Charter public schools and private schools using new digital learning techniques show dramatic improvements in student learning.*
6. *These schools can offer longer school days, small group instruction, reduced class sizes, lower instructional burdens on teachers, increased teacher pay, improved teacher training, and sustainable school budgets.*
7. *The lesson provided to all involved is that the flexible integration of digital and online tools into school programs can improve the academic achievement of students from all backgrounds, while enhancing teaching and utilizing limited public education funding.*

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Introduction

Over the past 20 years, innovative leaders have used the flexibility of public charter schools to improve on the traditional public school model as a way of educating children. These dynamic educators have taken full advantage of digital technology and new computer tools. These forward-looking schools offer longer school days, customized student learning, increased small group and one-on-one instruction, reduced class sizes, lower instructional burdens on teachers, increased teacher pay, improved teacher training, and dramatically improved student learning.

Educators often refer to the use of digital programs and online tools as "blended learning"; that is, an approach that combines traditional classroom instruction with student computer time and interactive online lessons.

This paper describes how leaders at six innovative schools have used modern technology and new digital learning methods to help teachers, improve the management of school budgets and, most importantly, improve learning for students. Four of these case studies describe public charter schools in California, New Jersey and Arizona. One case study describes how Khan Academy instructional videos have improved the study habits of disadvantaged students attending a charter high school in East Oakland, California. The sixth case study examines how leaders at a private Catholic school in Seattle used digital technology to save their school from closing.

It is instructive that these ground-breaking schools have not emerged from within the traditional public school system, but from public charter schools and the private sector. Public charter schools have proven to be a fertile ground for innovation in public education. Unlike traditional district-controlled schools, teachers and principals in public charter schools have the freedom and flexibility to try new ideas and to improve the education of children.

This positive trend is particularly significant for Washington state. In 2012, voters made Washington the 42nd state to allow school children to attend a public charter school. Local educators now have the opportunity to build on the success of blended learning innovations from other states. Administrators of traditional public schools will certainly be watching and learning from these cutting-edge developments, and these schools may soon follow in the footsteps of Washington's public charter school pioneers, for the benefit of their teachers, of their students and of their budgets.

Background

Public school classrooms today are mostly organized as they were 100 years ago, with rows or small tables of 20 to 30 students receiving instruction from one classroom teacher, occasionally with the help of an aide. This is the "batch learning" approach to education, one that works well when instructional resources are limited to one teacher conveying knowledge to a group of students at one time.

With batch learning, teachers aim their lessons at the theoretical "middle" of the academic ability of the class group.[1] This model has been criticized for shorting struggling students on needed instructional time, providing a boring class experience for academically strong students, and not sufficiently challenging students in the theoretical middle.

Digital technology now allows teachers to substantially alter and improve on the traditional model. Traditional schools have computer labs, internet access and computer learning programs, but on the whole these schools have merely added limited computer technology to their traditional educational programs.[2]

Teachers and administrators in traditional schools who try to use blended learning to improve instruction face a long list of obstacles.[3] First, school boards and district officials are reluctant to relinquish control over funding, preventing innovative teachers and principals from purchasing the digital software and equipment they need.[4] Second, many people in the education establishment say they are worried digital technology will replace teachers. Third, student/teachers ratios and class size restrictions negotiated through binding union agreements often block practical experiments in changing class sizes.[5]

Washington's new charter school law and the adoption of digital learning

In the fall of 2012, Washington voters passed Initiative 1240, to allow 40 charter schools to open over a five-year period.

Charter schools are public schools, open to all students, and they must provide the same basic education to their students that traditional schools provide. Since charter schools are accountable for educating students to an agreed-upon standard,

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1. Over the last 50 years, the student-faculty ratio has dropped from twenty-seven to one to fifteen to one. *Education Reform in the Digital Era,* Thomas B. Fordham Institute, (Thomas B. Fordham Institute, April 2012). See Introduction, Page 4.
2. *Disrupting Class; How Disruptive Innovation Will Change the Way the World Learns,* by Clayton M. Christiansen, Michael B. Horn and Curtis W. Johnson (McGraw Hill 2008), Chapter 3, page 72.
3. *Education Reform in the Digital Era*, Thomas B. Fordham Institute, (Thomas B. Fordham Institute, April 2012). This book describes these various obstacles as a variety of self-centered interest groups, including local districts and their school boards, unions, textbook publishers, and service providers.
4. The state of Utah has found a way around bureaucratic limitations, by giving control of public funds directly to local school leaders. Utah purchases educational technology in quantity through state Requests for Proposals and then offers the highest quality educational software licenses and technology to local schools through a competitive process. See "The Utah Model: Legislators Can Improve State Economies by Scaling Digital Learning," by The Honorable Howard Stephenson, UT (SD-11), *Inside ALEC*, September/October 2013, page 18.
5. In 2012, Ohio passed legislation allowing larger class sizes when teachers use digital learning technology to transform their classrooms. See "An Act," Amended Substitute Senate Bill Number 316, passed June 13, 2012, and signed by Governor Kasich June 25, 2012. Accessible at: www.legislature.state.oh.us/bills.cfm?ID=129_SB_316_. See Sec. 3302.41 (B)(1), which provides "Student to teacher ratios whereby no school or classroom is required to have more than one teacher for every one-hundred-twenty-five students in blended learning classrooms."

however, charter school leaders and teachers have considerable freedom over the design of their schools. This rare autonomy in the field of public education allows charter school leaders and teachers to re-think and re-organize every element of the traditional school model.

In charter schools that use a digital learning approach, teachers use computer programs to deliver daily instruction to their students. Students rotate from performing interactive learning tasks delivered by computer to spending time in small group instruction with a teacher. This gives the teacher an increased ability to meet individual student needs, in effect significantly reducing class sizes. New computer programs help teachers track individual student progress in great detail, allowing teaches to identify exactly where each student needs help. The detail on student progress reduces instructional burdens on teachers, so they are able to provide more one-on-one help to struggling students, and to praise students in areas where they are making progress.

Computer-aided instruction also allows students to proceed at their own pace, to repeat lessons as necessary, or skip over lessons they have already mastered. Students report that they enjoy the control and autonomy this form of learning allows. Digital technology provides a familiar learning environment for students who are well-practiced in using technology at home, and in their social and entertainment time.

As students mature, they assume more and more responsibility over their own learning. Students feel an increased sense of accomplishment as they direct their own lessons online, or report each stage of learning they have achieved to their teacher. Students discouraged by years of being left behind in a classroom setting can use computer programs and online Khan Academy videos to catch up and take charge of their education.

Under the new charter school law, these successful blended learning models will soon be available to children in Washington state. The second-largest district in Washington, Spokane Public Schools, plans to open a blended online learning charter school for middle and high school students. Enrollment will be voluntary; no family will be forcibly assigned to the new charter school. Spokane's charter application reveals the wider Spokane community, including its traditional schools, is interested in learning about the use of blended learning techniques.[6]

In addition to Spokane, 31 parent and community groups have filed Notices of Intent to submit charter school applications to the Washington State Charter School Commission and to Spokane Public Schools. Over a quarter of these Notices indicate plans to employ online learning tools in charter school classrooms.[7] Two of these blended learning charter school notices were submitted by the highly successful network based in Silicon Valley, Summit Public Schools.[8] Washington's new charter school law is making schools that have long provided a high standard of blending learning programs available to Washington's students.

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6. Spokane Public Schools, Charter School Authorizer Overview," Spokane Public Schools, June 28, 2013, Page 18, accessible at: http://www.sbe.wa.gov/documents/CharterSchools/SpokaneCharterAuthorizerApplication.pdf. On September 11, 2013, Spokane's application to authorize new charter schools was approved by the State Board of Education.
7. Washington State Charter School Commission, Application Information, available here: www.governor.wa.gov/issues/education/commission/applicant.aspx.
8. Summit is a high-performing public charter organization currently operating six schools serving a diverse population of 1,600 students in California. To date, nearly 100 percent of Summit graduates have been accepted to one or more four-year colleges and universities. Summit is ranked amongst the top 100 best high schools in the nation. See: www.summitps.org/

Following are six case studies of successful public charter and private schools that have used digital technology to improve learning opportunities for children.[9] These six examples are not presented in any particular order.

1. Rocketship Education – Improved pay and training for teachers

Rocketship Education, a charter school network in California, uses digital learning tools to transform traditional teaching methods. Founded in 2006 by John Danner, an engineer with no specific background or training in education, Rocketship operates seven public charter elementary schools in San Jose, California, and one in Milwaukee, Wisconsin. Rocketship Education serves 3,800 students, 90 percent of whom are low-income, and 70 percent of whom are from non-English speaking homes. Rocketship Education plans to open 20 new schools in the San Francisco Bay Area and seven more in Milwaukee, ultimately serving 25,000 students by 2017.[10]

At Rocketship schools, students spend about half of their instructional time each day in traditional classrooms of 20 to 25 students, learning English skills, language arts and social studies. The remainder of the day is divided between learning math and science in traditional classes and attending a learning lab in groups of 30 to 115 students for computer-based instruction, small-group learning, and independent reading time, all overseen by "individualized learning specialists," tutors and lab monitors. Since students learn basic subject skills from the computer, teachers can specialize in two subjects, such as math and science, or language arts and social studies. By specializing in this way, teachers can provide high-level, enriched instruction in these subjects in the classroom, while allowing students to hone what they've been learning with follow-up computer instruction.

Rocketship schools employ 25 percent fewer certified teachers than traditional schools. While traditional elementary schools employ about four formal teachers for every 100 students, Rocketship generally has three (sometimes four) - two for language arts and social studies and one for math and science for every 95 to 115 students. English and social studies Rocketship teachers are responsible for about 50 students, twice the number taught by teachers in a traditional school. Math and science Rocketship teachers reach about 100 students, four times the number taught by teachers in a traditional school. However, each teacher's time is reserved for direct, high-quality instruction, while students devote their routine learning and practice time to computer-aided or online instruction.

The Rocketship Education method has been extraordinarily successful. It is the top public school system in California for low-income elementary students, with 82 percent of its students scoring "proficient" or "advanced" on the California Standards Test for math in 2011-12, compared to 87 percent of students in California's wealthiest school districts.[11]

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9. D*isrupting Class; How Disruptive Innovation Will Change the Way the World Learns*, by Clayton M. Christiansen, Michael B. Horn and Curtis W. Johnson (McGraw Hill 2008.)
10. "Rocketship Education, Pioneering Charter Network Innovates Again, Bringing Tech Closer to Teachers," by Sharon Kebschull Barrett and Joe Ableidinger, 2013 Public Impact, Opportunity Culture.org, July 24, 2013, at: http://opportunityculture.org/rocketship-education-bringing-tech-closer-to-teachers/.
11. "Rocketship Education, Pioneering Charter Network Innovates Again, Bringing Tech Closer to Teachers," by Sharon Kebschull Barrett and Joe Ableidinger, 2013 Public Impact, Opportunity Culture.org, July 24, 2013, at: http://opportunityculture.org/rocketship-education-bringing-tech-closer-to-teachers/.

Rocketship's operating budget is based solely on the per-student revenue provided by the state, and as such generates $500,000 in annual savings. Rocketship uses this surplus to provide professional development to its educators and higher pay to teachers. Rocketship pays its teachers 10 percent to 30 percent more than their peers in the local public school system. At Si Se Puede Rocketship, a K-5 school, the school's excellent third-year teachers receive salaries of about $70,000, nearly 30 percent higher than their peers in a neighboring district.[12] Teacher satisfaction is higher as well, because teachers spend more of their class time on high-quality instruction and less on routine practice or monitoring student discipline, compared to teachers in traditional public schools.

2. KIPP Empower Academy – Digital learning and small class sizes

KIPP Empower, an elementary school in South Los Angeles, is part of the successful "Knowledge is Power Program" (KIPP) network of charter schools. Founded in 1994 by Mike Feinberg and David Levin, KIPP has grown into one of the largest and best-known college preparatory charter school networks in the country. KIPP's 141 schools now serve 50,000 students.[13] KIPP students are guided by the founders' Five Pillars: High Expectations; Choice and Commitment; More [Learning] Time; Power to Lead; and Focus on Results.

KIPP Empower opened the fall of 2010. Its principal, Mike Kerr, was selected through a KIPP leadership training program. Right away Principal Kerr faced an unexpected obstacle to opening a new school. Though California officials had originally promised KIPP Empower Academy enough funding to open with class sizes of 20, Principal Kerr found himself $100,000 short for the inaugural kindergarten class.[14] Principal Kerr decided to use digital learning technology to reorganize his staffing model, and still deliver small group, individualized instruction. KIPP Empower opened its doors to 231 kindergarten and 1st grade students; 91 percent were low-income; 8 percent were English language learners; and 10 percent were special education students. Instead of the original plan of five groups of 20 kindergarten students each, Kerr and his teaching team were able to form four classes of 28 students each, assisted by online technology.[15]

Kindergartners at KIPP Empower learn to read in 30 minute segments, one period spent in self-directed learning at a computer, one in small group instruction with a Lead Teacher, and one in small group instruction with an Intervention Teacher, trained to help individual students as learning problems arise. At each grade level, four Lead Teachers are supported by a combination of other teachers, with a 14-to-1 student-teacher ratio for kindergarten and a 19-to-1 student-teacher ratio for first grade.

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12. "Rocketship Education, Pioneering Charter Network Innovates Again, Bringing Tech Closer to Teachers," by Sharon Kebschull Barrett and Joe Ableidinger, 2013 Public Impact, Opportunity Culture.org, July 24, 2013, at: http://opportunityculture.org/rocketship-education-bringing-tech-closer-to-teachers/.
13. "The History of KIPP," Knowledge is Power Program, accessible at: www.kipp.org/about-kipp/history.
14. "Blended learning in Practice: Case Studies from Leading Schools, featuring KIPP Empower Academy," by FSG Consulting, Brad Bernatek, Jeffrey Coen, John Hanlon, Matthew Wilka, September 2012, accessible at: http://5a03f68e230384a218e0-938ec019df699e606c950a5614b999bd.r33.cf2.rackcdn.com/Blended_Learning_Kipp_083012.pdf.
15. "Blended learning in Practice: Case Studies from Leading Schools, featuring KIPP Empower Academy," by FSG Consulting, Brad Bernatek, Jeffrey Coen, John Hanlon, Matthew Wilka, September 2012, accessible at: http://5a03f68e230384a218e0-938ec019df699e606c950a5614b999bd.r33.cf2.rackcdn.com/Blended_Learning_Kipp_083012.pdf.

The school day at KIPP Empower is longer than that of most traditional schools. Instruction at KIPP is provided from 7:45 am to 4:15 p.m. daily.

KIPP Empower achieved impressive results in the 2010-11 school year, with the percentage of students reading at "proficient" or "advanced" increasing from 36 percent to 96 percent. On the MAP assessment test, 96 percent of KIPP Empower's students in both reading and math performed above the national average by the end of the school year.[16] Parents voluntarily choose to enroll their children at KIPP Empower, and parent satisfaction remains high.

KIPP Empower plans to add one grade a year through fourth grade. KIPP Empower's financial planning indicates the school will be able to support itself on state per-student funding alone by its fifth year in operation. It has had added spending on technology and technology support, but as the school adds students, leaders project savings from the staffing model will more than make up the start-up expenditures on technology.[17]

3. Merit Preparatory Charter School – Better training and higher pay for teachers

Merit Preparatory is a charter public school in Newark, New Jersey. Ben Rayer is the founder of Touchstone Education, the charter management organization which operates Merit Prep. Merit Prep is a good example of how these charter schools use digital learning technology to better train, support and pay teachers.[18]

In the fall of 2012, Merit Preparatory opened with 84 sixth-graders, 90 percent low-income students, most of whom were African-American and Latin-American. Most students entered the school several years behind grade level. At Merit Prep, Master Teachers work closely with a team of two other teachers – one full teacher and one associate teacher – to teach 80 or more students during each block of time. Administrators provide each student with a "playlist," or a weekly schedule of digital learning activities, personalized to each student's skill level. Teachers use student learning data to adjust student playlists by selecting appropriate digital content and traditional learning activities, and changing the curriculum or student use of class time as needed.

Master Teachers at Merit Prep teach two subjects, allowing their reach to extend to as many as 240 students. Master Teachers earn between $70,000 and $100,000 a year, full teachers earn $60,000 to $70,000 and associate teachers earn $50,000 to $60,000.[19]

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16. "Blended learning in Practice: Case Studies from Leading Schools, featuring KIPP Empower Academy," by FSG Consulting, Brad Bernatek, Jeffrey Coen, John Hanlon, Matthew Wilka, September 2012, accessible at: http://5a03f68e230384a218e0-938ec019df699e606c950a5614b999bd.r33.cf2.rackcdn.com/Blended_Learning_Kipp_083012.pdf.
17. "Blended learning in Practice: Case Studies from Leading Schools, featuring KIPP Empower Academy," by FSG Consulting, Brad Bernatek, Jeffrey Coen, John Hanlon, Matthew Wilka, September 2012, accessible at: http://5a03f68e230384a218e0-938ec019df699e606c950a5614b999bd.r33.cf2.rackcdn.com/Blended_Learning_Kipp_083012.pdf.
18. "Touchstone Education, New Charter with Experienced Leader Learns from Extending Teachers' Reach," by Sharon Kebschull Barrett and Jiye Grace Han, 2013 Public Impact, OpportunityCulture.org, Spring, 2013 at: http://opportunityculture.org/wp-content/uploads/2013/07/Touchstone_Education_An_Opportunity_Culture_Case_Study-Public_Impact.pdf.
19. "Touchstone Education, New Charter with Experienced Leader Learns from Extending Teachers' Reach," by Sharon Kebschull Barrett and Jiye Grace Han, 2013 Public Impact, OpportunityCulture.org, Spring, 2013 at: http://opportunityculture.org/wp-content/uploads/2013/07/Touchstone_Education_An_Opportunity_Culture_Case_Study-Public_Impact.pdf.

At Merit Prep the school day ends at 5:00 p.m., and teachers use the last three hours of the day to provide personalized reading instruction to supplement the morning lessons. Students also get an hour of physical education time each day.

By March 2013, just months after the school opened, students showed two years of learning growth in reading, and 1.25 years of learning growth in science. Merit Prep plans to enroll 560 students in grades 6-12.[20]

Merit Prep's funding model costs an affordable $9,000 per student per year, considerably less than the state provides to educate the average New Jersey student.[21]

4. Carpe Diem – High-quality learning and lower per student costs

Carpe Diem Collegiate High School and Middle School is a public charter school of 300 students in grades 6-12 located in Yuma, Arizona. The founder, Rick Ogston, is a former Marine, theology student, and family counselor. He places the highest priority on building a strong instructional team at Carpe Diem. He pays his teachers above-average salaries and benefits, and he selects teachers willing to learn to teach in a flexible, specialized way. Mr. Ogston has developed a digital learning model that excites and motivates his students to acquire their skills and knowledge on the computer.[22]

Each Carpe Diem student has an assigned cubicle and computer in a designated Learning Center room. Students rotate throughout the day from online instruction at the computer to face-to-face classroom instruction and teacher-led workshops. Class time is used to enhance or apply the knowledge students learned online. Each rotation period is 55 minutes. Students receive about 50 percent of their instruction on the computer, and the rest from a teacher. The school day is longer, from 7:30 am to 4:00 p.m., than in most schools, but there is no school on Friday, except for students who need extra help.[23]

Though students at Carpe Diem are similar in family background (half qualify for the Free and Reduced Lunch program and nearly half are Hispanic) to students who attend neighboring public schools, academically they perform significantly better. In 2010, Carpe Diem ranked first in its county in student performance in math and reading, and ranked among the top 10 percent of Arizona public charter schools. Results in 2009 were similar.[24]

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19. "Touchstone Education, New Charter with Experienced Leader Learns from Extending Teachers' Reach," by Sharon Kebschull Barrett and Jiye Grace Han, 2013 Public Impact, OpportunityCulture.org, Spring, 2013 at: http://opportunityculture.org/wp-content/uploads/2013/07/Touchstone_Education_An_Opportunity_Culture_Case_Study-Public_Impact.pdf.
20. "Touchstone Education, New Charter with Experienced Leader Learns from Extending Teachers' Reach," by Sharon Kebschull Barrett and Jiye Grace Han, 2013 Public Impact, OpportunityCulture.org, Spring, 2013 at: http://opportunityculture.org/wp-content/uploads/2013/07/Touchstone_Education_An_Opportunity_Culture_Case_Study-Public_Impact.pdf.
21. "Touchstone Education, New Charter with Experienced Leader Learns from Extending Teachers' Reach," by Sharon Kebschull Barrett and Jiye Grace Han, 2013 Public Impact, OpportunityCulture.org, Spring, 2013 at: http://opportunityculture.org/wp-content/uploads/2013/07/Touchstone_Education_An_Opportunity_Culture_Case_Study-Public_Impact.pdf.
22. "Carpe Diem public charter schools seize the day and the future," by Liv Finne, Washington Policy Center, April 18, 2012, at: www.washingtonpolicy.org/blog/post/carpe-diem-charter-public-schools-seize-day-and-future.
23. "Carpe Diem charter public schools seize the day and the future," by Liv Finne, Washington Policy Center, April 18, 2012, at: www.washingtonpolicy.org/blog/post/carpe-diem-charter-public-schools-seize-day-and-future.
24. "Carpe Diem charter public schools seize the day and the future," by Liv Finne, Washington Policy Center, April 18, 2012, at: www.washingtonpolicy.org/blog/post/carpe-diem-charter-public-schools-seize-day-and-future.

Carpe Diem receives no local levy funding or funding from private foundations, and it delivers a high-quality education for the state per student amount of $5,300. In comparison, Washington state in 2012 spent an average of $10,237 per student.[25] The Carpe Diem model saves money in staffing costs: 15 staff for 300 students, or 20 students for every employee. The ratio of students to staff in Washington schools is half that, at 9.7 students to every employee.[26]

5. Khan Academy – Promoting student responsibility

Salman Khan, the founder of the Khan Academy, is a 36-year-old educator who dramatically shows how digital technology can transform education for children. From a small home office, Khan has produced over 4,300 ten-minute videos, mostly in math and science subjects, from kindergarten level through post-college graduate school. To date, the Khan Academy has over a million online subscribers. Collectively Khan Academy videos have been viewed more than 283 million times.[27] More than ten thousand teacher-led classrooms, serving 350,000 students around the world have used Khan Academy lessons accessed online, independently of any formal program organized by the Academy.[28]

Before founding the Khan Academy in 2009, Salman Khan worked as hedge-fund manager, with experience in venture capital and engineering at Oracle and at several Silicon Valley technology firms. He holds Bachelor of Science degrees in math, electrical engineering and computer science, a Masters Degree in computer science from Massachusetts Institute of Technology, and a Master of Business Administration from Harvard Business School. He does not hold a formal state teaching credential, nor has he earned a degree from an official School of Education. Due to union work rules Mr. Khan would be barred from teaching in public school in most states. Yet because of their access to his teaching skills online, thousands of students report that Khan Academy videos have helped them pass their math and science courses, and even fulfill college-level requirements in engineering.[29]

Teachers at Oakland Unity High School, a charter school in East Oakland, California, where 95 percent of students are African-American or Latin-American and, 85 percent are low-income, are using Khan lesson videos to raise the academic achievement of students. David Castillo, the principal, and Peter McIntosh, the algebra teacher, describe the problems facing their students:

"Through close observation and student interviews, we found that students failed to engage in the coursework and spent little to no time studying. Students were disengaged from their learning responsibilities and the derailing of their studying began as early as elementary school.

25. "Workload, Staffing, Finance, Statewide," Washington State Fiscal Information, accessible at: http://fiscal.wa.gov/K12.aspx.
26. "Carpe Diem charter public schools seize the day and the future," by Liv Finne, Washington Policy Center, April 18, 2012, at: www.washingtonpolicy.org/blog/post/carpe-diem-charter-public-schools-seize-day-and-future.
27. The One World Schoolhouse; Education Reimagined, by Salman Khan (Twelve Books 2012) and "Salman Khan (educator)," Wikipedia, at: http://en.wikipedia.org/wiki/Salman_Khan_(educator).
28. The One World Schoolhouse; Education Reimagined, by Salman Khan (Twelve Books 2012), page 169.
29. The One World Schoolhouse; Education Reimagined, by Salman Khan (Twelve Books 2012).

Early on, students struggled and faced constant frustration on a series of topics: long division, fractions, negative numbers, and word problems. This discouraged students and led to a decreased interest in engaging in the classroom or completing homework. Yet the bar of expectation and demonstration of competency was low. Students still continued on to the next grade in a one-size-fits-all educational approach despite their lack of knowledge and understanding around basic algebraic concepts."[30]

Mr. Castillo and Mr. McIntosh found that Khan Academy online videos give students the freedom to persevere at their own pace and on their own time, and the chance to repair the bad habits that were preventing learning.[31] Mr. Costello and Mr. McIntosh say:

"We believe that our use of Khan Academy is resulting in a fundamental change in student character—with responsibility replacing apathy and effort replacing laziness. We believe that this character change is the primary reason behind the stunning results we are beginning to experience—at both the class level and in individual students."[32]

The president of the Khan Academy describes why he believes online instruction is so successful at motivating students to learn:

"Students are free to learn anytime, anywhere. Students can jump to where help is needed most, and spend as much time as necessary to master concepts. The content of each lesson is short (about eight minutes), fun, approachable, and easily digestible. There is a clear and continuous path to learning complex topics.

"Students feel an increased sense of ownership - they are learning, not 'being taught.' The focus on core conceptual understanding ensures students build the necessary skills that are applicable in any curriculum used in schools.

"Interactive practice ensures concepts truly sink in. Rich data helps teachers monitor progress and provide focused support. Teachers are able to make their classroom experiences more fun, engaging, and social for students, with less lecturing and more project-based learning and peer tutoring."[33]

Khan Academy gives students the chance to correct their own learning deficiencies, in the privacy of their own minds, while working with a Khan Academy video. In this way, Khan Academy addresses a psychological obstacle to student learning – a student's reluctance to reveal to teachers and peers that he does not understand the lesson.

Salman Khan's digital approach to teaching is bringing fresh knowledge and skills to people across the globe, and to many students in his own country. His online lessons are also helping educators rethink how to motivate students to take responsibility for their own education.

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30. "Khan Academy: Learning Habits vs. Content Delivery in STEM Education," blog post by Principal David Costello and math teacher Peter McIntosh, March 20, 2012, Getting Smart, accessible at: http://gettingsmart.com/2012/03/khan-academy-learning-habits-vs-content-delivery-in-stem-education/.
31. "Khan Academy: Students Regain Confidence to Tackle Math Challenges, blog post by Principal David Costello and math teacher Peter McIntosh, March 27, 2017, Getting Smart, accessible at: http://gettingsmart.com/2012/03/khan-academy-students-regain-confidence-to-tackle-math-challenges/.
32. "Khan Academy: Students Regain Confidence to Tackle Math Challenges, blog post by Principal David Costello and math teacher Peter McIntosh, March 27, 2017, Getting Smart, accessible at: http://gettingsmart.com/2012/03/khan-academy-students-regain-confidence-to-tackle-math-challenges/.
33. "Does Khan Academy Really Work?" by Shantanu Sinha, The Huffington Post, October 12, 2011, accessible at: http://www.huffingtonpost.com/shantanu-sinha/does-khan-academy-really-_b_946969.html?view=print&comm_ref=false.

6. St. Therese Catholic Academy – Digital learning as a way to save a school from closing

Three years ago St. Therese Catholic Academy, a private K-8 school serving mostly poor children in Seattle, faced closure. Enrollment had dwindled to 90 children and rising expenses threatened the school's viability. To revitalize their school, leaders at St. Therese modeled their school after the successful Rocketship and KIPP charter schools, by adopting digital technology to support their teachers in the classroom.

Today, St. Therese operates completely different than it did three years ago. St. Therese now has 190, mostly low-income African-American students, and is led by a new, dynamic principal, Mr. Anton Kramer. St. Therese is using both technology and a culture of motivation to transform the way children are taught. Children work in daily rotations on the computer, followed by small group work with a classroom teacher.

St. Therese's digital approach to learning has saved money. St. Therese has reduced costs by between $1,500 and $2,000 per child, or approximately 25 percent, with tuition at about $8,000 per student. Class sizes at St. Therese are now at 30 students per class, yet because many routine learning tasks are now self-directed on computers, all students receive the individual attention they need. Teachers have time to spend with students who need extra help, while students who have mastered a lesson online can move ahead at their own pace. Overall, students at St. Therese are successfully making progress in their learning, outperforming national averages in student growth in reading and math.[34]

Conclusion

Over the past 20 years, digital technology has dramatically increased the productivity of the global economy and wrought positive changes in nearly every field of human endeavor. Computers and online access have transformed the work place, revolutionized buying and selling, and put at our fingertips instantaneous access to information that in the past would have taken weeks to gather. Businesses expect employees to master programs and technologies so they can remain competitive. Yet one area in which online technology has had little impact is the public school classroom. The average public school remains stuck in the pre-internet past, failing to take advantage of the full potential of technology in education.

These six case studies described here show how leading innovators in education have used digital learning tools to improve the school environment for everyone – teachers, students, and school administrators struggling to balance school budgets.

34. Author interview of Mr. Anton Kramer, principal of St. Therese Catholic Academy, August 12, 2013.

John Danner (Rocketship Education), Mike Kerr (KIPP Empower), Ben Rayer (Merit Prep), Rick Ogston (Carpe Diem), Salman Khan (Khan Academy), and Anton Kramer (St. Therese Catholic Academy) have seized digital and online learning tools to transform their schools. With these digital tools, they have encouraged and motivated the disheartened student, re-invigorated the bored student, reached the disaffected student, and extended the reach of great teachers.

Not every public school needs to rigidly imitate the methods these leaders used to achieve success. Instead, the lesson they provide for policymakers, parents and educators is that the flexible integration of digital and online technology into local school programs can improve the academic achievement of students from any socio-economic background and at every level of ability, while enhancing the profession of teaching and making the most of limited public education funding.

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