

League of Women Voters of Greater Las Cruces

The One World School House: Education Reimagined
by Salman Khan

Summary Report by Bonnie Burn

Don't limit a child to your own learning for he was born in another time.
--Rabindranath Tagore

School reform during the latter part 20th century and into the 21st century has been deliberate, seeking to make education more equitable and pushing for higher standards, greater accountability, and more impressive academic results. Salman Khan sought to help his cousin, Nadia, with a gap in her knowledge of mathematics. In undertaking long-distance tutoring, he designed a free, computer-based, self-paced education program that can be accessed by individuals from anywhere in the world. It can be incorporated into public school systems. Teachers are an integral part of the program, and the classroom becomes a welcoming, active learning environment.

Khan begins with basic questions. How do people actually learn? When and where do people concentrate best? Does the standard classroom model of broadcast lectures and solitary homework at home in the evening make sense in a digital age? Why do students forget so much of what they have supposedly *learned* as soon as an exam has been taken? Why do grownups sense such a disconnect between what they have studied in school and what they do in the real world? Khan answered these questions over time as he worked with Nadia and other tutees and developed the philosophy and tools of the Khan Academy.

Sal Khan, a successful hedge fund analyst with a degree in mathematics, electrical engineering, and computer science from MIT (Massachusetts Institute of Technology) and an MBA from Harvard, had no vision of leaving a footprint on public education. He innocently began tutoring his cousin, Nadia, in 2004 when she had difficulty with *unit conversation* on a math test. Not having any pedagogic training, he used common sense tutoring, employing Yahoo Doodle and Skype sessions to help Nadia. While tutoring Nadia and later many other family members, he gradually formulated his computer-based, self-paced, mastery learning philosophy that he expanded into online education.

To help the reader understand the progression, he divides his book into four parts. What follows is a summary of those parts.

Part 1: Learning to Teach: While continuing to work as a hedge fund analyst, Khan began tutoring Nadia. The situation was manageable because it was a one-on-one situation. However, as success of his tutoring spread through the rest of his family, he soon found himself tutoring 10 students. To manage this number, he took up the suggestion of posting the video lessons on YouTube. This proved to be his first success. The lessons were short--to meet the YouTube guidelines of 10 minute segments. On YouTube the videos reached a larger viewing audience. The lessons could be viewed whenever or wherever a student wished. The lessons could be viewed over and over again (computer-based lessons never disappear) until the student mastered the concept and did not allow moving to a higher level concept before comprehending a preceeding concept. Using a chalkboard and voice only (no person in the picture) were deliberate choices to avoid any unnecessary distraction. Tutoring remained an intimate, one-on-one experience, working out problems together.

Khan's view is that we educate ourselves. When we commit ourselves to learning, concentration is focused and all of the tasks and associations that surround concepts are encompassed into the learning experience. These processes are active and deeply personal and involve the acceptance of responsibility for learning. He discusses how learning occurs in the brain and how achieving comprehension and durable memory occurs when we are able to associate new learning with learning from the past.

In his view, no subject is ever finished. No concept is sealed off from other concepts. Knowledge is continuous; ideas flow (pp. 50-51).

This is very different from the current model used in many classrooms where a teacher presents a unit of study through lectures to students. The students listen passively and then take homework home where there is no help from the teacher. The students are tested, and the unit is over. The teacher moves on to the next unit to whether or not the previous unit is totally comprehended because the curriculum schedule requires it. As a result, "Swiss Cheese" or gap learning occurs, and the gaps have to be repaired if future, more advanced concepts are to be mastered. According to Khan active learning is owned learning that begins with giving students the freedom to learn where and when they desire and using their own personal rhythms for learning.

This kind of learning fosters not only a deeper level of knowledge, but excitement and a sense of wonder as well. Nurturing this sense of wonder should be education's highest goal; failing to nurture it is the central tragedy of our current system (p. 58).

Part 2: The Broken Model: The reader learns about how our current school structure was developed. Although Khan does not propose tossing out the system, he believes that what is needed is a new perspective--a fresh look at the most basic assumption about teaching and learning--and determining what works, what doesn't work, and why.

The current western classroom model is hard to change because it has been in place for a long time, but it is a *human construct*. Briefly, the day is divided into periods, the teacher talks, the students listen, lunch is eaten, physical education provides some exercise, and homework is done at home. Human thought is chopped up into subjects and the concepts are chopped up into units without connection to each other. Students are tracked. The variety and nuances that distinguish students from each other such as intelligence, imagination, and talent are ignored. The complexities of teaching and learning are denied.

A brief history of education begins with parents teaching children skills for survival and advancing civilization. Apprenticeship programs shifted education to an outside authority and taught skills that ensured students could earn a living. Writing and printing introduced textbooks and recorded knowledge through the years.

Formal education is attributed to the Prussians who sought to create loyal, tractable citizens who would learn by submitting to the authority of parents, teachers, church, and ultimately the King. This model developed a K-12, primary and secondary school system that began at a certain age and ended after a certain number of grades. The length of school day, school year, division of day into periods, and slicing of disciplines into subjects were proscribed. Education was compulsory and tax-supported. The state directed what should be taught and who should teach it. Regimentation took precedence over personal initiative. This system lifted many people into the middle class and affected Germany's rise as an industrial power. The U.S. adopted this model in the first half of the 19th century. Notable were Horace Mann's efforts as Secretary of Education in Massachusetts about 1890.

To this day there is debate about who should have authority for the education of children and how corporate and employer workforce needs are met through education. Although the Prussian education model was a product of a particular time and set of customs, Khan questions these assumptions as relevant for our current times. The bullets below represent issues covered in this part of the book.

- He questions the gaps in knowledge created by the division of subjects into units and the fact that units are not connected to units in other subjects. Students are not connecting what they learn in the classroom to what they encounter in the outside world. Valuable classroom time is allocated to preparing for the next test.
- He describes testing as a snapshot of where the student stands at a given moment in time and says nothing about retaining subject matter or about the student's potential to learn a subject. The test squeezes students into categories that often define and limit their futures. Khan urges a measure of skepticism and caution in how much weight we give to test results alone.
- Khan believes creativity is underappreciated and is stifled in the segmented, unit learning of a traditional classroom. Math, science, and engineering are not viewed as "creative" fields such as art and music.
- Why homework? One perspective on homework is that it teaches students responsibility, accountability, and time management; allows students to learn on their own; and involves parents in the process. Khan quotes a study from the University of Michigan that suggests the strongest predictor of better student achievement scores and fewer behavioral problems is the frequency and duration of family meals. Here there is an exchange of ideas, individuals show a true interest in each other, and children gain values and self-esteem that leads to motivated learning. Homework may be necessary because enough learning has not gone on in the classroom during the school day. In Khan's view, broadcast lectures, one-pace-fits all learning are not an efficient way to teach and learn, and homework does not necessarily foster learning (p. 114).
- In proposing to "flip the classroom," Khan suggests opening the classroom to *problem solving* that enables the teacher to act as mentor and help students progress from concept to mastery, leaving the lecture to be done independently by the students at their own pace. The model makes the teacher and more advanced students allies who, by tutoring, help students who are having difficulty. Ironically, technology is transforming the traditional passive classroom into something more interactive and human. Independent, on-line learning can be done anywhere (i.e., home, bus, park, interspersed with in-class exercises) and it increases productivity.

In my opinion it is far better to miss out on the lecture than the problem-solving. The lectures are gravy; the real meat of the learning occurs when peers are learning and teaching one another alongside the teacher (p. 117).

- A final chapter in this part discussed the economics of schooling. Based on 2008-2009 data, the cost of educating public school students can range from \$10,499 to as much as \$18,126 per year for a secondary student in New York, and from \$200,000 to \$300,000 per classroom of 25-30 students. Private schools can average \$40,000 per student and \$400,000 to \$800,000 per classroom of 10 to 20 students. Instead of focusing on student-to-teacher ratios, focus should be on student-to-valuable-time-with-the-teacher ratios. This leads to rethinking classroom models. Technology can help reduce the cost of education, but it won't help if the method of learning is not changed. The majority of time in the classroom should be spent with the teacher working with children; face-to-face, one-on-one, talking and listening.

Part 3: Into the Real World: This is the heart of how the Khan Academy became a reality. By 2007, philosophically he had a large data base of what was working for the 2,000 students who had logged on to his YouTube videos. He was interested in refining what was working. He also decided to leave his secure job and use personal savings to develop the Khan Academy. He knew the students using his

courses didn't really know math but knew certain words and processes that described math. His goal was to have students master concepts; therefore, he devised software that generated math problems and a database that showed how many problems the students got right or wrong, how much time was spent, and the time of day the student was working. To manage a greater number of students, he developed a "knowledge map" that advised students of their accomplishments and what to work on next. He also decided that the standard for mastery should be raised higher than current classroom expectations. As a result, he decided on a simple heuristic of 10 correct answers in a row.

Khan was given an opportunity to work at Peninsula Bridge, a summer program in the San Francisco Bay Area, that provided educational opportunities to motivate middle school kids from under resourced schools and neighborhoods. This experience verified that the time spent on finding and fixing gaps in math knowledge saved time and deepened learning in the long run. The teachers also suggested refinements in the assessment tool that showed where the students became stuck. Again, a heuristic that identified "stuck" was developed. If a student did not get 10 correct answers in a row among 50 problems, the student was "stuck." A daily spreadsheet of rows for student's name, columns for concepts, and cells that showed the number of problems worked, right or wrong, the longest stuck period, and time spent became invaluable (p. 145).

In 2009, there was an additional opportunity to engage in a fun and games summer camp experience that Khan and a fellow engineer, Aragon Burlingham, designed. He called it *stealth learning*, and the goal was to make education more efficient--to help kids master basic concepts in fewer hours so that they would have more time left for *other* kinds of learning. Computer-based learning was combined with a project such as robotic construction and games that involved psychology, game theory, probability, and other real-life experiences.

To legitimize the Academy, this online program had to be tried in the classroom as part of a formal curriculum during an actual school year. In 2010, Sal Khan sought outside financial help. Ann and John Deorr were his first angels followed by Bill and Melinda Gates, who used the video lessons with the Gates' children. Google financed translation of the videos into other languages. Through this financial support, Khan obtained office space and hired engineers to develop, update, and create software. Thus, Khan was able to establish the online Khan Academy.

In 2010, the Khan Academy conducted a pilot program in the Los Altos, California, public school system with two fifth grade and two seventh grade classes. This experiment offered an opportunity to rethink classroom education. The students began taking charge of their educations. The teacher and some students facilitated as mentors and helped other students with problem-solving challenges. The Academy engineers sat in the classroom and through observation were able to tweak the software to meet new challenges. "The best tools are built when there is open, respectful, two-way conversation between those who make the tools and those who use them" (p. 165). Standardized tests were used to prove this kind of learning was successful. The big question was will the testing reflect what the students have learned? Results for seventh grade students showed an increase of 106%. No students were tracked into slow classes. A decision in 2011 was to expand the Khan Academy into *all* fifth and sixth grade classes (1100 students) in the Los Altos School District.

A final foray into the real world included videos for adult learners. While researching his need to learn more about the financial crises of 2008, Sal Kahn developed some videos about the issues involved in that crisis. These videos were accessed by professional journalists, commentators, business writers, financial advisors and TV anchors. This activity raised the issue of why does education stop at some point? Why isn't it lifelong?

Part 4: The One World Schoolhouse: In this final part, Sal Khan lays out his philosophy and ideas about changing the way education may be conducted in the future. There is no doubt that his current curriculum in math is successful. In his opinion, among the world's children starting in grade school this year, 65% of the students will end up doing jobs that haven't been invented yet. He believes that what we teach our children is less important than how they learn to teach themselves. A grounding in basic math and science, using language to communicate effectively, and awareness of history and politics is needed to feel at home in the world. Knowing how to learn, wanting to learn, and confidence in finding the tools to find answers to questions are important skills.

He discussed his own experience in higher education where he used skills and knowledge to test out of subjects, and instead of attending lectures, he pursued independent learning to master concepts in his majors of mathematics, electrical engineering, and computer science.

He maintains that the traditional model of education that involves memorization and one-size-fits all curricula geared to testing discourages and excludes students. Although not completely utopian, he believes that an updated version of the old concept of the one room schoolhouse would work well, and he gives the Marlborough School for girls in Los Angeles as an example. In his view, classes would be merged together to provide a mixed-age student population. Teachers could teach in tandem and ally with more advanced students to provide coaching, mentoring, and tutoring of students who need help. Computer-based, self-directed education would be part of the environment, as well as a curricula of subjects mixed with projects and other activities that would better prepare students for living in the real world. Summer would be redefined so that students were learning all year long, and students and teachers would take vacations as the need arose. Letter grades would be replaced with portfolios that represented a narrative of the students' progress throughout the year including evaluation of ability and willingness to help others. Standardized tests of a more open-ended design would be used.

In his concluding chapters, Khan includes his vision of higher education. He believes that higher education should provide an intellectual experience that leads to a more expansive world view. Instead of seeking a degree that leads to a job, the goal should be to have a good intellectual experience. He gives examples of the University of Waterloo, Canada, that offers internships--as many as 24 months throughout the college experience--that gives students actual, real world experiences in their fields of study. He describes a college for those who wish to work in Silicon Valley, California, that would provide meaningful projects and exposure to some of the best minds in the field of computer science. He values a degree but also wants students to continue to have experiences that tap into their creativity.

Summary: By accident, through tutoring his cousin Nadia, Salman Khan created a computer-based, self-paced education system. It allows students throughout the world to use video lessons to master concepts in math and other subjects. It is compatible with a public school environment and changes the learning structure so that the teacher can be coach, mentor, and tutor to students who need help. More advanced students can help fellow students. Students can take responsibility for their own education. The whole program is FREE. Khan's mission of providing a free, world-class education for anyone, anywhere is being achieved through the Khan Academy.

[Education Committee Comment: It is important to acknowledge that in the last four decades good colleges of education and good classroom teacher have engaged in the important practices described by Khan: the project-based learning where students learn from their peers in teams, block-scheduling that accommodates project-based learning, teacher teams in which connections are made between subject matter content, and where teachers play the role of mentor and coach.]