Is this the Education Revolution We've Been Waiting For?
An Essay Review of *The One World School House*

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There is a recognizable genre of popular educational writing in which the author, after lamenting the failure of conventional modes of schooling to adapt to a changing world, goes on to propose something radically different. Such books can provoke a flurry of excitement and debate among readers and may even be catalysts for a few experimental schools or pilot programs; however, when all is said and done, they usually leave conventional schooling as entrenched as it was before. Early in the twentieth century John Dewey's *The School and Society* met such a fate (see Labarree, 2005); about forty years ago Ivan Illich's *Deschooling Society* (1972) captured the imagination of many of us, but had virtually no impact on actual schooling. The same could be said of Seymour Papert's *Mindstorms*, published a decade later (Papert, 1981). The lament varies in detail but at its core is the charge that the nineteenth century "factory model" of schooling betrays the humanity and the individuality of children, treating them as so many pieces of interchangeable "inputs" that need to be subjected to the identical molding processes if they are to emerge prepared for contemporary society.

 Salman Khan's *The One World Schoolhouse: Education Reimagined* fits comfortably within this genre, but there's an important difference. Khan has, himself, transformed some of his ideas into actuality—indeed his online Khan Academy *preceded* the articulation of the vision found in the book. Khan may not have been the first to recognize that the institution of the world-wide web heralds educational opportunities that are waiting to be exploited, but he's undoubtedly the most successful and arguably the most famous. I'll first describe the institution he created, then summarize the main elements of his educational vision before attempting to evaluate both.
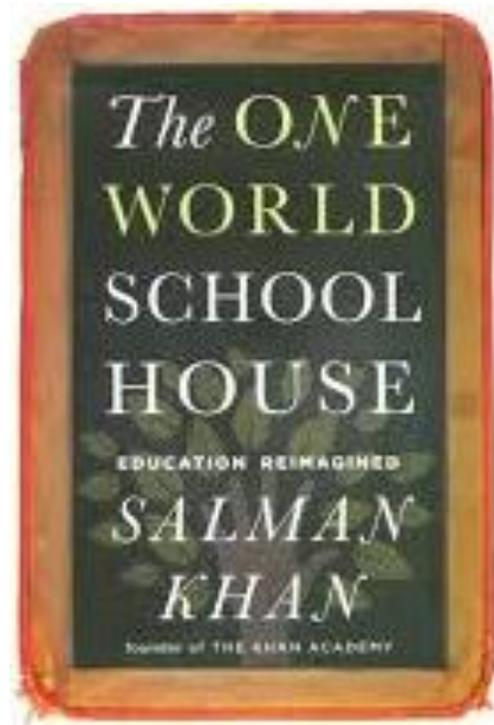
The Khan Academy

The Khan Academy consists of video lessons in an array of subjects—primarily but not exclusively in mathematics and the sciences--available *free* in 17 languages (and 50 more with subtitles) anywhere in the world where there's access to the internet. According to a March 17, 2013 Wikipedia entry, as of that date, the Khan academy had delivered more than 240 *million* videos.

The One World Schoolhouse, among other things, traces Khan's evolution an educator. While working as an analyst at a hedge fund, he began tutoring his niece in

mathematics over the phone. Eventually he was working with a few students over Skype when a friend suggested he post his lessons on YouTube. Word of these tutorial modules spread and Khan eventually gave up his day job to devote himself full-time to providing video math lessons for a growing number of students. A key turning point occurred when Bill Gates, who had been using the modules with his own children, approached **Khan**—identifying him as his favorite teacher—and contributing a substantial donation to accelerate the growth of the Academy.

The bulk of the modules are in mathematics, and beginning with the simplest arithmetic —telling time—they cover every topic taught in elementary, middle, and high school through college calculus. The modules, lasting from three to twelve minutes, show only an electronic blackboard on which Khan writes with different colored markers as the lesson proceeds. His conversational exposition is the only thing heard. Below the video screen are questions viewers have asked and answers concerning the topic. The student can access practice exercises, randomly generated to avoid duplication. If the student's answer to a question is correct, a smiley-face appears. If not, the student can receive hints to its solution. The student and teacher—if the individual is a student in a school-- can then receive a record of his or her progress over time, and pinpoint where difficulties arose. In a classroom setting, the cumulative records of each student enable the teacher to zero in on just what difficulty a particular student is experiencing. When a student completes a unit successfully, she receives a badge from the Khan academy to indicate her progress.

The Educational Vision

The videos are not innovative nor are they intended to be. They offer clear and direct exposition of subject matter. This does not mean that Khan believes that education ought to simply involve sitting in front of a Khan Academy screen, absorbing the lessons, and then solving the related problems. On the contrary, Khan is a strong exponent of what's come to be known as the "flipped" classroom. Why "flipped"? In most classrooms, the teacher makes a presentation during class and students then practice and work with the new concepts or ideas at home. In the "flipped" classroom, the students absorb the didactic portion at home online and the classroom is used for a range activities employing what students

learned. "My hope was to make education more efficient, to help kids master basic concepts in fewer hours so that more time would be left for *other* kinds of learning. Learning by doing. Learning by having productive, mind-expanding fun (pp. 149-150, italics in original)." The students would also use school time to tutor other students having difficulty or to receive help from students or from the teacher. Khan has experimented with the idea, first in summer programs and then in elementary and middle-school classrooms in a poor neighborhood of the Los Altos, California School District.

In theory, Khan offers a neat resolution to an abiding conundrum—how to combine the didactic with the exploratory. From Plato and Rousseau to the present, educational reformers have proposed ways that students could discover or "construct" their own knowledge, or ways they could simply pick it up by engaging in activities that elicit their passion and energy. For centuries critics have pointed out that, despite the enhanced motivation children might bring to these activities, such engagement will be insufficient to produce the necessary mastery of subject matter. The critics say that teachers need to cultivate children's determination to succeed *despite* the absence of immediate gratification. In Khan's vision, video lessons accessed at home or in school supply the necessary didactic ingredient, freeing the classroom teacher to engage students in the playful and exploratory, so kids can employ the ideas they've learned and test them in action.

Working with kids in math convinced Khan that many students, even those who've earned good grades, are victims of what he calls "…Swiss cheese learning. Though it seems solid from the outside, [their] education is full of holes." (p. 85) My own experience working in math with fifth graders has convinced me that Khan is right about this. The conventional classroom almost guarantees that all but a few students will have a shallow and fragmentary understanding of mathematics. After all, if after spending the requisite class time trying to teach a concept in arithmetic, the vast majority of a teacher's students pass the tests at an acceptable level, the teacher must move on to the next topic. How else will she cover the material she's expected to? Khan rejects this logic, arguing that given the time to revisit topics only partially understood and given sufficient practice, almost all students can and should achieve sufficient mastery of a concept in order answer virtually every question on it before moving on to the next. Khan embraces the mastery learning model, devised by Carleton Washburne in the 1920s and revived by Benjamin Bloom in the late 1960s.

> In a traditional academic model, the time allotted to learn something is fixed while the comprehension of the concept is variable. Washburne was advocating the opposite. What should be fixed is a high level of comprehension and what should be variable is the amount of time students have to understand a concept. (p. 39)

In Khan's mastery model, the timing, location and duration of the didactic portion of the curriculum is under the student's control to a much greater extent, and Khan claims this promotes students' responsibility for their own learning.

If a child is able to progress through an elementary topic at her own pace without disrupting the progress of a the child working next to her at an advanced topic, Khan argues, the rationale for age-graded classrooms which are designed to track approximate levels of learning breaks down. According to Khan the school of the future should be "an updated version of the one-room schoolhouse." (p. 194) Here, as Khan points out, older children can mature by taking some responsibility for the care and learning of younger children while the younger ones can benefit from having older kids to look up to and emulate.

In chapters on homework, testing, and transcripts, Khan has sensible and intelligent, if not particularly original things to say. On homework, Khan says that although we spend a lot of time asking how much homework is appropriate, we fail to ask a prior question: If children were really learning in school, would homework even be necessary? Khan thinks not, and surmises that more time interacting with family might be more valuable than time spent alone with homework. Khan deplores our dependence on test scores, which he shows are but an imprecise proxy of *some* of the things learned in school. In his ideal school, badges for mastery would replace letter grades, and a "multi-year, data-based

narrative" would give some insight into "candidates' tendencies in terms of their willingness to help, to give, to pursue not only their own goals but the general good of a community or team." (p. 219) Since the badges would be available to anyone willing to work through the modules, opportunities both for higher education and for employment would become more merit-based and less dependent on the wealth of the neighborhood or prestige of the institution one attended.

Although Khan has some intriguing suggestions for higher education and his scheme for subsidizing Khan academy learning centers in the developing world is worth discussing, I will not summarize those here. Let me conclude my description of Khan's vision by summarizing his discussion of creativity and the ends of education. Khan believes the proper goal of education is to discover and nurture the "natural bent of the child." What does he mean by that?

> To me, it refers to the particular mix of talents and perspectives that makes each mind unique, and that allows for some minds to be strikingly original. This originality is related to intelligence, but not identical to it. It correlates with differentness and not infrequently with strangeness. (p. 247)

Khan believes that more creativity would emerge from the school he envisions because more time would be available for activities in which boundaries between subjects would be obliterated and students

could pursue particular lines of inquiry for as long as they were motivated to.

Khan's Critics

An innocent reader might suppose that anyone who made thousands of video lessons covering the entire K-12 math and science curriculum, then offering them all without cost on You Tube would be hailed as a hero by all concerned with the improvement of children's learning, but this is not the case; in the politicized terrain of education, no one can be a hero to all. Indeed, what Khan's critics lack in numbers (no pun intended) they more than make up in intensity. (The best entry to these criticisms and the ensuing debate they generate is through Valerie Strauss' *Washington Post* Blog, "The Answer Sheet.") Let me, then, try to formulate the principal criticisms, and evaluate them.

1. Critics discern a huge discrepancy between Khan's vision and the video lessons of the Khan academy: Although Khan talks the good progressive talk—students passionately engaged in meaningful activities, deep understanding rather than superficial mastery, addressing problems that have multiple solutions or even no "correct" solution, eroding the boundaries between academic subjects and of "units" within subjects, intrinsic instead of extrinsic motivation, collaboration instead of individual competition, projects not bounded by rigid class periods—the Khan academy modules don't walk the progressive walk. They feature, instead, the most conventional kind of lesson: the teacher telling students how to solve problems, typically in one way,

and often without explanation of the underlying principles. The student's job is exactly what it is in the conventional school, working through problem sets on a single topic to get the answer the teacher has chosen. After a sufficient number of right answers, the student is rewarded with a badge.

As I suggested above, this objection misunderstands the purpose of the Khan academy. It is not intended to be a substitute for the classroom, but simply to present the indispensible didactic dimension in a way that frees up class time for the progressive activities Khan endorses. Khan certainly believes—as do thousands of his students--that he's an effective teacher but the Khan Academy modules do not aspire to be innovative.

2. Some mathematics teachers denounce Khan for the occasional errors that are found in his presentations, or for presenting algorithms without providing the basic understanding that would permit students to make sense of them. A frequent target is his presentation of the multiplication of negative numbers. Taking pairs of numbers in which either member can be either positive or negative, Khan tells students that if the signs agree, the product is positive; if they disagree, it is negative. (e.g. -3 x +3 = -9; -3 x -3 = + 9). This can be misleading if we add a third negative term to the second problem (i.e.-3 x -3 x -3) in which case the product is *negative* 27 even though the signs agree. Khan obviously knows this; no doubt in trying to simplify the issue for students, he gave them a rule that could mislead.

While it is true that in the first module on the topic of multiplying with negative numbers, there is no explanation of the algorithm, the subsequent module provides an intuitive understanding, indeed, one that enabled me for the first time to understand the rationale for the algorithm. In thousands of video lessons it would be a miracle if there weren't some errors, and I think it is churlish of critics to pounce on them. Moreover, the question is not whether Khan's exposition is flawless but whether it is an improvement on what students are currently receiving in their math classes. The fact that so many parents, even mathematically sophisticated ones, embrace the videos, and so many students and even teachers are using and extolling them, is the best answer to these critics.

3. Karim Kai Ani, a math educator, who has produced his own online curriculum for math *teachers*, albeit one that is not free, criticizes Khan for presenting math as an arid, decontextualized subject with no relationship to the world (See Strauss, 7/23/12). He argues that math is only truly engaging when learned as a set of tools that help us understand and grapple with real-world problems, such as whether to buy a warranty for a lap-top or how to determine the best shooter in a basketball game. Ani's own curriculum includes engaging materials for teachers and students in school, students who learn essential math concepts while engaging in open-ended explorations of intriguing practical problems. Ani doesn't script his lessons for teachers. He is better seen as a composer who produces a score, but the interpretation is left to the teacher

and students and will vary from group to group.

Ani certainly sees his own math lessons as a vast improvement over Khan's; indeed, his approach comes much closer to Khan's progressive vision than Khan Academy's own lessons. But this is exactly in line with Khan's own agenda: allow students to review or acquire some of the basic math tools at home in order to free up school time for the kinds of activities Ani offers. I see Ani's work, found on his website Mathalicious, as *complementing*, not competing with Khan's.

But Ani and other math educators voice a deeper criticism of Khan Academy mathematics modules: they claim that because of the enormous financial backing behind Khan Academy, what is being reinforced is not simply a less engaging pedagogic style, but a less adequate view of mathematics itself: Khan is seen as focused on numbers as abstractions divorced from action and context, and algorithms divorced from conceptual grasp. Instead of ushering us into a newer and better understanding of the nature and purpose of mathematics, Khan math simply reinforces the sterile, alienating, and antiquated view of the subject that has dominated for decades. The contrast between "deep, conceptual grasp" and "shallow deployment of rules and recipes" is a familiar trope here, but not all mathematicians find the contrast useful: Consider this comment by Timothy Gowers, one of the world's leading mathematicians from his *Mathematics: A Very Short Introduction*:

I implicitly drew a contrast between being technically fluent and understanding difficult concepts, but it seems that almost everybody who is good at one is good at the other. And indeed if understanding a mathematical object is largely a question of learning the rules it obeys rather than grasping its essence, then that is exactly what one would expect—the distinction between technical fluency and mathematical understanding is less clear cut than one might imagine. (Gowers, pp.132-133)

Considering how one might help students struggling to understand why their solution to a problem with exponents is wrong, Gowers suggests "such students might benefit from a *more* abstract approach." (p. 133, emphasis added). I don't know if Gowers is right about this; I want simply to suggest that the weight of the argument is not all on the side of Khan's opponents.

4. Derek Muller, a creative physics educator and producer of brilliant videos to teach science, while enthusiastic about Khan's teaching in math is skeptical of the impact of Khan's physics videos, not because they contain errors, but because they don't (Muller, 2012)). Let me explain. In Muller's videos college students among others are shown to harbor deeply instinctive but erroneous intuitions about the physical world, about matters like force, gravity, temperature. When students are told the "correct" answers, they don't really absorb

them and still cling to their erroneous conceptions. Muller shows that what it takes to liberate students from their false beliefs is to present them with both their own misconceptions *and* the correct notions. This, Khan's physics videos fail to do. What makes physics different from mathematics, claims Muller, is that children from an early age come to the subject with deeply entrenched ideas. It only takes a look at a few of Muller's own videos to agree that he's right about that.[1]

5. Many educators, so the blogs suggest, are enraged, not so much by Khan himself but by the Khan phenomenon: Here we find an MIT and Harvard educated former hedge fund analyst with no coursework in education and no experience as a classroom teacher. His own videos contain errors and are anything but innovative. To add insult to injury, Khan is handsomely bankrolled and extolled by some of the richest, most tech-savvy people in America, who think they've finally found a technological magic bullet for whatever is ailing American education. These people have no understanding and no sympathy for the complex and demanding work of the classroom teachers, and see teachers' unions, any unions, as obstacles to progress.

I understand where these critics are coming from, but since they are not really criticizing Khan himself, it's best to simply acknowledge this groundswell of resentment, and leave it at that.

Before concluding this section, let me offer a couple of criticisms of my own. The first is focused on Khan's endorsement of

mastery learning. Khan's primary focus as a teacher is on mathematics, secondarily on the sciences, with only a nod to history among the humanities. In the case of mathematics, I think the mastery learning model fits beautifully with the new technology just as Khan contends. Recall the two basic ideas, first that in order to avoid "Swiss cheese" learning, no student should progress to a more advanced level until she has truly mastered the previous level; second, that the diversity of student backgrounds and capabilities implies that different students will need different amounts of time to master any given concept. The reason mastery learning is especially suited to mathematics is that it makes sense to think of mathematics as involving concepts that build upon prior concepts in a logical way. For example, one cannot understand multiplication until one has understood addition, one cannot understand multiplication of fractions until one understands multiplication of whole numbers, and so on. It follows that there's consensus about the logical relationships among the elementary concepts. No one proposes teaching subtraction before addition or fractions before whole numbers. Mathematics, is, itself, a cumulative structure with concepts built upon other concepts so the pedagogical order is pretty much determined by the subject matter, at least at the elementary level, rather than by the interests of a particular group of students.

Karim Kai Ani's approach appears to reject this. Ani chooses topics—e.g. whether a computer warranty is worth purchasing--

because of their ostensible interest to students. But Ani's video analyzing the value of purchasing a warranty, for example, will only make sense to students who have mastered the prior concepts of percentages, decimals, probability, etc. Without a substantial mastery of those concepts, the lesson would be meaningless. I'm not claiming that students' backgrounds and interests should be simply ignored when deciding when or how to introduce a mathematical concept, only that unless the lesson builds upon the *mathematics* the students *already* understand, it will be a wasted effort. The question I want to raise is whether humanities subjects, such as history or poetry are as well suited to mastery learning as mathematics.

Consider poetry. There are surely easier and more difficult poems, and it's also true that poems deploy a variety of poetic devices, rhythm, rhyme, onomotopeia, metaphor, metonomy, and so on. Would it not make sense, then, to teach students to identify each device to a mastery level before moving on to the next just as in mathematics. The idea is mildly repellent, but why? I think there are two reasons: First, poetic devices do not build upon each other as they do in mathematics. For example, a child does not have to appreciate rhythm in order to appreciate metaphor, or the reverse. More fundamentally, though, the poems we want to present to children are ones that will tickle, delight, and move them, and there is no necessary relationship between the impact of a poem and the number of devices the poet employs. Nor can we be sure that the poems that delight

these children will delight *those.* Personal and social background matter in a way they don't in mathematics. It is only once children respond intuitively to a poem that it begins to make sense to help them discover how the poet succeeded in generating that response. And the point is surely to provide a level of understanding that will send the students to the library or the internet in search of more poetry. A mastery approach appears to make poetry into an entirely cognitive, puzzle-solving affair, which is likely to alienate students from the whole genre.

History, likewise, does not seem to be a matter of cumulative mastery of concepts of increasing complexity one built upon another. And here, too, successful initiation into the subject seems to be highly dependent on who the students are and what they've experienced. A teacher facing a class of undocumented immigrants might legitimately select a different route into studying the past than one facing a class of children who've been in the country for generations. But, surely, it will be said, history has a clear, logic imposed by its chronology. The American Revolution preceded the Civil War, which preceded the Civil Rights movement, which preceded the election of Barack Obama, and so on. True enough, but chronological order doesn't dictate pedagogical order. One might begin, for example, begin with the election of Obama and what it meant to the students' own parents or grandparents, and then discuss the Civil Rights movement to understand why blacks voted so overwhelmingly for Obama, then go back to

the Civil War and its aftermath in the South to see why that region never embraced racial equality. Moreover, while it's true that the chronology of events imposes some constraints, it does not determine the point of view from which to study those events or the emphasis to be given to one or another dimension: In teaching the Civil Rights movement, how much emphasis should be given to the the principal actors in the South, to the role of white northerners, especially the President? How about the role of institutions, such as the FBI, the Congress, the TV networks? Should the economics of desegregation and the Cold War background to the struggle be part of the narrative? Should white resistance to integration be represented in a way that generates contempt or appreciation for the resisters? None of these questions has a "correct" answer. Much depends on the age and background of the students and the educational aims of the teacher. Finally, even if one agreed that historical events should be treated in their chronological order, and even if one agreed on what to include and how to represent it, what would it mean to *master* a historical episode? To select ten correct answers in a row on a multiple choice test, to criticize an influential account, to compare alternative analyses of the episode, to use documents of the time to write one's own account? Any answer would be arbitrary.

What I'm trying to say is that in the humanities, it appears that the subject matter does not dictate the core concepts to be mastered or the order of pedagogical exposure in the same way that it does in mathematics. This means that any single

series of video lessons in those subjects designed for all U.S. children (much less all children the whole world over) will be rightly seen as partial and arbitrary, an attempt to impose an "official" story on a society that has come to recognize a plurality of stories. As the Khan Academy attempts to cover more and more of the pre-collegiate curriculum, it therefore risks incurring increasing criticism and even hostility from educators and from engaged parents.

A final issue I'd raise concerns Khan's notion that the authorized curriculum so central to conventional schooling stifles the unique creativity of students by forcing them down a common path instead of allowing them to wander down byways of their own choosing at their own pace. Khan believes that "…fundamental coursework can be handled in one or two hours a day. That frees up five or six or seven hours for creative pursuits, both individual and collaborative." (p. 248) Although I also favor a school day that makes more room for activities many consider peripheral to academic learning, activities like theater and robotics, I think Khan is misled here by his own experience as a precocious math student in high school seeking to go beyond what his school had to offer. Thanks to his persistence in refusing to take "no" for an answer, by senior year Khan says he "spent more time at the University of New Orleans than at my own high school." (p. 185)

Because Khan, himself, had mathematical talent and interests from an early age, he believes, too romantically I'd contend, that

most students arrive at school with some gift and passion, and all schools need to do is provide space and time for them to bloom. This may well be true of a small percentage of students, but what of those others whose primary interests lie in hitting baseballs, playing violent video games, following their "friends" on social media, getting tattoos and body piercings, polishing their nails and cutting their hair, or reading about the couplings and uncouplings of Hollywood celebrities? Surely philosopher Michael Oakeshott is right when he says,

> School is an emancipation achieved in a continuous redirection of attention. Here, the learner is animated, not by the inclinations he brings with him, but by intimations of excellence and aspirations he has never yet dreamed of.
> (Oakeshott, 1972/1989, p. 69)

In other words, the educator's responsibility does not end with providing access to the basic subject matter and then getting out of the way. The young coming into school cannot be expected to already be educated sufficiently to commit themselves to an activity worth pursuing.

The Big Question

I have spent more time discussing the Khan Academy than Khan's educational vision because this is what's really new and this is what raises the question many are asking: Is the Khan Academy an educational "game changer"? I'll focus on math, because that is currently the heart of Khan Academy. I

think we have to approach the question from the point of view of its potential impact on a variety of actors. Consider the mathematically talented ten-year old anywhere in the world who has internet access but whose own teachers have a very limited grasp of the subject. This student now has a capable teacher at her beck and call. Moreover, she can test her growing mastery continually as she progresses through the curriculum. This student's prospects for joining the educated elite have been enhanced immeasurably.

Consider next the parents of students who have never had very good math instruction, who are floundering in math class, and who, perhaps, have never really understood some foundational concepts. Or, parents who are disaffected from their local public and private schools and seek to home-school their children. These parents now have access to a solid, patient tutor, available any time of day or night at no cost. The students can go back to some elementary math or they can review lessons on algebra or geometry as many times as they wish. By working through the accompanying problems, these students can begin to catch up to their peers. They can also pose questions and have them answered by experts. Not every child will be able to learn in this way, but the evidence is overwhelming that many thousands are.

Next, consider the teacher in a school where the principal is enamored of the notion of the "flipped" classroom, and expects her teachers to institute it. Here is where the Khan academy is expected to foment a

revolution in schooling. Let's suppose the idea is that the students watch a math video for homework, coming to school for more exploratory work or for tutoring on a concept they failed to grasp. When students work among themselves in pairs or in groups with the teacher moving around the room, the potential for disorder is heightened, especially if the tasks aren't well thought out and don't induce all the children to participate. If some students have already mastered the concepts taught in the videos, what would encourage them to participate when they know the examination is likely to contain problems with correct answers like those found online, not like the open-ended ones associated with the flipped classroom? If some students failed to grasp Khan's video exposition, is it realistic to expect their teacher or a more capable student to help them through the difficulty? In many cases, it is not. In Khan's vision, students of different ages would occupy the same classroom space. While this would facilitate some of the positive interactions Khan anticipates with older children mentoring and caring for younger kids, it could also permit less desirable interactions with older children initiating younger ones into activities of questionable value.

Classroom teachers often lecture or direct questions to students from the front of the classroom, and this is sometimes seen as mere habit or deference to venerable pedagogic tradition. But it is motivated by more than that; it is motivated by the need to keep order among a group of children prone to find more entertaining alternatives than paying attention to the lesson. The teacher

can keep an eye on all the students from her perch at the front of the classroom, and by calling on students whose attention is perceived to wander, she can keep all but the most determined troublemakers focused on the lesson. The problem of keeping order in the classroom has bedeviled "progressive" pedagogy in all its incarnations. Where it has succeeded, it has usually been with small groups of students and unusually skilled teachers.

In sum, I do not think that online instruction will, by itself, spawn the kind of transformation Khan hopes to provoke— though exciting pilot programs are sure to emerge here and there-- but over time, online courses may do something more important, cut the cord that has bound subject matter learning to school classrooms for centuries. In the not too distant future, every student will have access to a good online tutor in any subject at the place and time she or her parents choose. Moreover, such tutors will no doubt evolve in their ability to diagnose just where students are having difficulties, and they will have a repertoire of responses to help students overcome them. So, we are led to ask whether—aside from keeping children safe while their parents are out of the house-- schools will really be needed, and if so, for what?

I am not suggesting that the prospect of millions of students learning school subjects from online tutors for a few hours each day, perhaps isolated at home, or gathered in some other public or private facility, is an inspiring vision of education. It is clearly an

impoverished one, but it forces us, precisely, to ask: What is missing? Two dimensions come to mind: first, the personal growth and inspiration that come from being initiated into a valuable pursuit, be it in the arts or crafts, in music, mathematics, poetry or sports, by an adult who becomes not simply a tutor but a role-model. Sometimes this kind of initiation happens in a one-on-one encounter between student and teacher; sometimes it takes place in a group, but usually a small one. Here is how Oakeshott captures this dimension in one of his essays on education.

> And if you were to ask me the circumstances in which patience, accuracy, economy, elegance and style first dawned upon me, I would have to say that I did not come to recognize them in literature, in argument or in geometrical proof until I had first recognized them elsewhere; and that I owed this recognition to a Sergeant gymnastics instructor …for whom gymnastics was an intellectual art—and I owed it to him, not on account of anything he ever said, but because he was a man of patience, accuracy, economy, elegance and style. (Oakeshott1965/1989, p.62)

It is no doubt possible to learn a great deal of mathematics, physics, perhaps even history or poetry online, but I suggest the teachers who've influenced us the most have *meant* something to us in a way no online instructor could. Let's recognize that not

every child has the chance to encounter such a role model. Indeed, the majority of children never find such a role model in all their years of schooling. But for those of us who have been fortunate in this way, I daresay we cannot imagine the role being filled by an online teacher, no matter how skilled her presentation or how dazzling her online persona.

A second dimension typically absent from online instruction is the opportunity to be a member of group of young people learning together and working toward a common goal, as in a student theater production, orchestra, or student newspaper; or on a chess, football, cheerleading, robotics, or debate team. Precisely because these are not solitary pursuits, individuals learn to adapt and accommodate themselves to the needs of a larger whole. And because, unlike tests or other work done for teachers, these activities typically culminate in public performances or products, students are very likely to invest their strongest effort, lest they let their fellow participants down.

These two dimensions are often, though not necessarily connected, because successful teams or theater productions are often led by "coaches" who motivate and inspire young people's best efforts, and for this to happen, a personal relationship is indispensible.

But do the two dimensions I've identified necessarily require the *school*? In a sense, no. We can imagine these activities dispersed throughout the community. But after contemplating the logistical challenges of moving children, especially young children about, it makes practical sense for

the children to congregate in designated locations, and for the adult coaches and mentors to travel to where they are. In other words, it seems to me that even if a lot of the cognitive training children require will in the future be taken over by online offerings, we will still want places where children can be initiated into worthy pursuits by adult mentors, as well as places where they can join together with other children under the guidance of "coaches" to engage in activities that require "teammates." We will still call these schools.

Suppose that more and more students receive their didactic instruction online. What would this mean for the future of teaching as an occupation. Prediction here is folly, and I'll not attempt it. It might result in the further downgrading and deskilling of teachers as professionals. Schools could become places where children spend most of the day in front of computer monitors, where teachers become little more than baby-sitters and hall monitors. But it could conceivably also portend an era in which progressive teaching, with its interdisciplinary, collaborative projects and "hands-on" learning—found for example in the expeditionary education movement— would flourish.

Concluding Thoughts

I would like to conclude this essay by situating the Khan Academy in two larger frames. The first concerns the acceleration of technological advance. It was only in the late 15th century that printed mathematics

textbooks became available. If Euclid published his *Elements* around 300 BCE, that means that for more than fifteen centuries, handwritten copies provided the sole access to the work. Now, of course, half a millennium after the first printed edition of the *Elements*, anyone with a computer and access to the internet can download the text free of charge.

It is noteworthy that the textbook has almost always been regarded as a complement to, *not* a replacement for a live teacher in a classroom. Why? Presumably, because few young people have the reading skill or the motivational commitment to learn from textbooks alone. That is why industrialized societies have felt a need to provide one teacher of mathematics (who may, of course, teach other subjects) for every 25-50 school-age children from kindergarten through high school. Teaching as an occupation has long been perceived to be resistant to the replacement of personnel by "machines." No teacher's job has been threatened by the introduction into schools of new communications technologies like film or computers. On the contrary, schools have often had to hire new personnel to facilitate that introduction. Is the Khan Academy any different?

The most obvious difference is that Khan Academy does *not* require the mediation of a teacher. Unlike the textbook, there is no obvious reason that Khan's modules must be supplemental to lessons given in a classroom. Students need not be literate to make use of them, and they need only be willing to pay focused attention for about

ten minutes at a stretch. Let me be clear here. I'm not saying that children, younger children especially, will develop and thrive without interaction with adults. On the contrary, but does that imply that the most important role these adults can play is as teachers of academic subjects. At this moment I still find it hard to wrap my mind around the idea that a single online teacher could conceivably replace thousands of live teachers in thousands of classrooms. The existence of Khan Academy forces us to recognize that possibility, and to ask: Why not?

The second context I'd like to put the Khan Academy into is that of social inequality both within US society and between us and the developing world. Is Khan Academy a step on the path to greater equality or will it exacerbate inequality? Both scenarios are possible; those who see Khan's lessons as working to equalize achievement, are probably comparing Khan's lessons to those of teachers who, given current evidence concerning the general level of math proficiency, whether it be in the US or in the developing world, are not succeeding. Those who see Khan as exacerbating *in*equality, are probably thinking of the US and comparing his online modules to the teaching of the very best mathematics tutors, those who not only have deep knowledge of their subject but are able to tailor every step of every lesson to the strengths and weaknesses of the individual student. I believe it is foolish to think that any technological advance will eliminate the immense educational inequalities that currently exist. But I believe it is just as

foolish to declare today that efforts like Salman Khan's are destined to exacerbate those inequalities. We will just have to wait to find out.

Note

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References

Gowers, T. (2002). Mathematics: A very short introduction. Oxford and   New York: Oxford University Press.

Illich, I. (1972). *Deschooling Society*. New York: Harper & Row.

Labaree, D. (2005). Progressivism, schools and schools of education: An American romance. *Pedagogica Historica* 41(1,2), 275-288.

Muller, D. (2012). Do Khan academy videos promote "Meaningful learning. http://www.openculture.com/2012/06.

Oakeshott, M. (1965/1989). Learning and teaching. In T. Fuller, ed. *The voice of liberal learning: Michael Oakeshott on education*. New   Haven: Yale University Press.

Oakeshott, M. (1972/1989). Education: The engagement and its frustration. In T. Fuller, ed. *The voice of liberal learning: Michael Oakeshott on education*. New Haven: Yale University Press.

Papert, S. (1981). *Mindstorms: Children, Computers, and Powerful Ideas*. New York: Basic Books.

Strauss, V. (7/23/12 and 8/02/12). http://tinyurl.com/k9hr7rl

Watters, A. (6/19/2011). The wrath against Khan: Why some educators are questioning Khan academy. http://tinyurl.com/bqfmtfq

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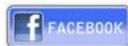
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