Panel on Digital Technologies in K-12 White Paper
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Introduction

Week 7 of "Education's Digital Future" consisted of a panel of four guest speakers: Catherine Casserly, CEO of Creative Commons; Tom Vander Ark, author of "Getting Smart: How Digital Learning is Changing the World"; Steve Midgley, deputy director of Education Technology at the U.S. Department of Education; and Prasad Ram, founder and CEO of Ednovo, a nonprofit that is developing a "search engine for learning" called Gooru. Together, they explored key questions concerning "evolution of digital curricula." As textbooks and associated learning resources go digital, the character and even meaning of "curriculum" is in flux. Digital delivery raises large new intellectual-property questions. Curricular products have been fairly cleanly divided between published material, such as conventional textbooks, that are considered intellectual property, and syllabi, which are akin to culinary recipes—informally shared and changed by multiple users for free. Three big trends are shaping developments in digital curricula: OER (Open Educational Resources), e-textbooks (Kno, Apple), and a new ecosystem of educational social media/curriculum companies such as EdModo, Gooru and GrockIt. New peer study and social media features in networked e-text platforms such as Kno and OpenStudy are also creating value for learning in 'paradata.'" This paper will discuss and detail themes that resonated with the audience during the panel.

Speaker Backgrounds

Steve Midgley, Former Deputy Director of Education Technology

Steve Midgley was the Deputy Director of Education Technology at the U.S. Department of Education from May 2010 to January 2012. His principal areas of focus are data transparency, digital interoperability and online learning. Prior to arriving at the U.S. Department of Education, he was the Director of Education at the FCC, where he headed the team that developed the Education chapter of the National Broadband Plan. Prior to government service he was the principal of Mixrun, a CTO consultancy for a number of for-profit and education sector organizations. Mixrun's clients included California Department of Education's project called Brokers of Expertise, which uses on-line and real world systems to share and build the expertise of educators. He is currently back with Mixrun part-time, while continuing to act as a part-time

consulting advisor for the Department of Education. Steve also served as a Program Manager for the Stupski Foundation for six years, designing and implementing grants for technology in K-12 education. In the 90's, Steve was the founding Vice President of Engineering for LoopNet Inc., a commercial real estate listing firm. He designed and built LoopNet's technology and web systems from its inception.

Prasad Ram, Founder and CEO of Ednovo

Prasad Ram obtained his B.Tech in Computer Science and Engineering from Indian Institute of Technology Bombay in 1987, and went on to pursue his M.S. and Ph.D. in Computer Science from UCLA. After working for companies such as Xerox PARC, Yahoo! and Google, Prasad founded and is currently the CEO of Ednovo, a non-profit education technology start-up whose mission is to honor the human right to education. Ednovo develops Gooru, a search engine for learning. Teachers and students can use Gooru, free of charge, to search for rich collections of multimedia resources, digital textbooks, videos, games and quizzes created by educators in the Gooru community. Prasad argues that millions of children around the world are desperate to learn and open educational resources are the best option available to them.

Tom Vander Ark, CEO of Open Education Solutions and a partner in Learn Capital

Tom is the CEO of Open Education Solutions and a partner in Learn Capital, a venture capital firm investing in learning content, platforms, and services with the goal of transforming educational engagement, access, and effectiveness. In addition, he is the author of Getting Smart: How Digital Learning is Changing the World and founder of GettingSmart.com, a website focused on advocacy, advisory and public relations services for digital learning. Previously he served as President of the X PRIZE Foundation and was the Executive Director of Education for the Bill & Melinda Gates Foundation where he implemented $3.5 billion in scholarship and grant programs. Tom was the first business executive to serve as public school superintendent in Washington State. He is a director of the International Association for K-12 Online Learning (iNACOL) and several other nonprofits.

Catherine Casserly, CEO of Creative Commons

Catherine Casserly has dedicated her career to working towards shifting the boundaries of informal and formal learning to provide greater access to all learners. She believes that digital space should be shared and values transparency both to open opportunities and to improve the craft of teaching. Casserly is a long time champion of Open Education Resources (OER), working directly in the field since 2001 when she joined the Hewlett Foundation and directed their OER initiative. Prior, she worked for Carnegie Foundation for the Advancement of Teaching where she lead work to increase transparency and started initiatives that creatively used technology to overcome challenges facing young learners. She has continued to be an active advocate for organizations that are working towards OAR, sitting on numerous boards and publicly providing support. Currently, as CEO of Creative Commons, she directs the organizations efforts to provide copyright licenses in order to enable individuals and organizations to share creative content on the web.

Key Themes in Student Responses

Feasibility of Personalized/Customized Learning

The topic of curriculum and delivery personalization seems to have both proponents and detractors. While the panel's position is bullish on the concept, there seemed to be varying opinions on the feasibility and truly customizable nature of the teaching and materials. A number of perspectives can be employed to assess the viability for personalized learning.

Proponents note that there are examples of customized learning and/or hybrid models currently being implemented in education. Kareem Edouard posted an article about Hybrid High, which "helps students with 'home issues' that have trouble getting to school." The customized nature of the school allows for accommodation of "the individual needs of students most at risk for dropping out due to job and family care obligations. The ninth grade students in this inaugural cohort vary dramatically in academic achievement, according to math teacher Stefnie Evans. Exemplifying the school's customized curriculum, she has enrolled her students in eight distinct mathematics courses according to the specific needs and abilities of each student." (Oct. 31, 2012) In reference to an earlier session, Julia Cambre wrote about her belief that customization was the third revolution in education. She writes, "Algorithm-driven instruction (like the Pearson/Knewton math programs at ASU) can help students entering college at very

different levels to get on track. This is also gaining popularity in K-12 schools like the Rocketship charters." (Oct. 21, 2012)

However, skeptics argue for a number of reasons why personalization might be unfeasible or a long ways off. Jason Oscar Randolph, a Learning, Design, and Technology Masters student in the Stanford School of Education, believes that there is not enough understanding of what personalization in education actually means. He notes that "there's been a great deal of use of the term personalization in the medical field as well. And a great deal of the proposed "personalization" in Medicine is hand waving. After watching that hand waving for the last four years in my field of study, I've come to the conclusion that the personalized proposals are a long ways off. Looking at an example of personalization in Education shows a similar situation. Many people view themselves as visual learners and complain about the lack of visual tools used in their own educational programs. But many of the studies that support the actual existence of different learning styles lack evidence. According to Pashler et. al (2008), 'there is no adequate evidence base to justify incorporating learning-styles assessments into general educational practice.' So we're investing in this construct of personalization when we have very little evidence or even understanding of what personalization in education even means." (Nov. 8, 2012)

Molly Bullock, a doctoral candidate in the Stanford School of Education, also noted some skepticism about the progress of personalization, largely due to the decentralized effort for customization. She writes, "Now, I am optimistic that the train has left the station, that we already on the path to achieving this future. But I am also clear that we can barely lay the train tracks fast enough to keep up with the trajectory of the train. More astounding still, the people building the tracks are not working from a unified plan, each stakeholder, whether philanthropic, government, corporate, or academic are each laying rails without common agreement on the final destination." (Nov. 8, 2012)

Hallie Fox, a Masters student in the Stanford School of Education and former teacher, notes that lack of buy-in from teachers might doom any personalization initiatives. "Teacher buy in is critical if we truly want to change core practices. Although I am enthusiastic about what technology can do to leverage individual achievement, I am cautious about the plan for implementation. What Vander Ark and others suggest is a complete overhaul of core teaching practices that have been developed and retained for well over a century (or more!). School

reform is slow, steady work. Ambitious yes, but we need to be realistic about the barriers to implementation. We need curriculum, teaching strategies, training, and development to be thorough and reflect teacher needs and student learning." (Nov. 8, 2012)

To further dissect this topic, the question can be asked: if personalization is as beneficial to learning as its proponents believe, what is hindering its progress? Paul Franz, a Learning Science and Technology Design PhD student in the Stanford School of Education, notes that it might be the misalignment of the incentive system. "Too much education policy tries to change learning outcomes without thinking about the marketplace in which those outcomes occur. Change the incentives not just for whether technology is adopted (trying to change outcomes directly), but rather for how that technology is deployed and implemented." (Nov. 8, 2012)

While customization in digital learning seems to be a potentially beneficial concept, many experts and education insiders view the trend with some skepticism. Just as there are problems implementing other solutions in education, they are weary about the actual benefits of personalization as well as the ability for the players in education to effectively utilize and implement the technology in a way that truly improves the experience and outcomes of students.

Access

Technology is often praised for being able to create a level playing field for students due to the ease with which electronic educational resources can be distributed. The opposite may turn out to be the case, though. All the benefits of technology in education are meaningless if these resources are inaccessible to schools, teachers, and students.

The issue of access is of big concern in developing countries such as Africa and India, where many people live below the poverty line. This may seem contradictory given that "we [are] sold the bill of goods that MOOCs will change the world because ... everyone has [access]"; for example, 75% of Africans have cellphones (Kareem Edouard, 11 Nov. 2012). Rather than blindly accepting that technology will improve education in developing nations such as Africa, it is necessary to validate such a promising claim. Unfortunately, for many people living in developing countries, having access to technology competes directly with having access to basic necessities such as food. As asserted by Kareem Edouard, "access [in developing countries] is not cheap or equal" (11 Nov. 2012). He offers the compelling example in an Economist article of Kenyans who would "forgo meat at meal time, in the hope of making a call or sending [a text message] that would enable them to put more food on the table later." When technologies are

created for people living in these destitute environments, various factors such as "money, time, internet access, … [and] cultural acceptance" must be considered (Daniel Greene, 12 Nov. 2012). Clearly, the economics of accessing technology are the main impediment to greater adoption of technology in developing countries. Only when Internet access and cellular data plans become less expensive, or when digital "hubs" where people can download, for instance, an entire course for free are created (Daniel Greene) will developing countries be able to enjoy the full benefits of technology in education.

Even in developed countries such as the US, there are still various hurdles impeding the widespread implementation of technology in classrooms. For instance, Kristen Howell describes how in her first two years of teaching, from 2008-2010, she "did not have reliable or stable internet access in [her] classroom", preventing her from integrating technology into her lesson plans. In this case, it was the school's antiquated infrastructure that made it virtually impossible to transition to more digitally-enhanced education (10 Nov. 2012). Even today, many classrooms in developed nations do not have the necessary resources or infrastructure in place to sustain technology-enhanced curricula. In order for technology to be adopted, this vital infrastructure must first be in place. One of the panelists, Tom Vander Ark, discussed that he expected the US educational system to transition to personalized digital learning within the next 36-48 months, coinciding with the nationwide transition to digitally-based assessments sometime between 2014 and 2015. However, this timeline was met with a heavy dose of skepticism from the audience. Jason Sellers, for example, did not believe that schools are equipped to scale so rapidly give that, again, very few have any sort of infrastructure in place (10 Nov. 2012). Other audience members such as Albert Lim were left wondering about extremely important considerations such as how much it would cost schools, and where funding would come from to make this transition possible (10 Nov. 2012). As if these concerns were not enough, Steve Midgley "broadened the swath of standing obstacles to include questions of digital identity, markets, school culture, the role of parents, school boards, and government regulatory frameworks" (Molly Bullock, 10 Nov. 2012). Clearly, there are several obstacles currently limiting the access that students and teachers have to technology-based education resources.

Despite being hailed for being able to standardize education across markets and even across continents, technology, at least in its current incarnation, works to create even larger gaps between socioeconomic levels. As pointed out by Devney Hamilton, profit is "deeply at odds

with the goal of students' learning" (25 Nov. 2012). It gives unfair advantage to more affluent schools and students who are able to afford technology-based educational resources developed by for-profit educational organizations. Hamilton suggests that this problem caused by profit-obsession may be mitigated by having the revenue go through schools instead of through angel-funded startups (25 Nov. 2012). This is a contentious proposal, but it may pave the way for other solutions to this problem. For example, Sunshine Library, a non-profit organization in China, develops specially-designed tablets for students in poor Chinese villages (10 Nov. 2012). This demonstrates that non-profit organizations can have a huge influence in "[letting] the hope grow" (Manwen Ivy Guo, 10 Nov. 2012).

Timing

A key theme throughout the panel was that of timing. Catherine Casserly of Creative Commons shared a vision of educational content becoming an open commodity in the near future, but without specific timing details. Tom Vander Ark followed more aggressively, suggesting that each of his trends in digital curricula could happen in as little as two years, and the most audacious in as few as five to seven years. He went so far as to predict that flipped classrooms will become ubiquitous by the end of the decade. This generated a noticeable skepticism in the classroom, that was eased by Steve Midgley's more sobering review of key obstacles hindering the adoption of more digital curricula—infrastructure, non-market systems, culture, and regulation.

Without bias, Max Alexander summarized one of the key themes in the responses: "The most surprising pieces of the discussion from the Tuesday night panel was the speed with which the panelists (particular Tom Vander Ark) saw the educational system moving towards open educational resources." Dozens of students jumped in to support or criticize the timing predictions made by the panelists, especially Tom.

Molly Bullock offered a concise summary of Tom's arguments, "Tom Vander Ark discussed the shift to personalized digital learning and shared the timeline of 36-48 months. This timeline, he explained, is implicitly linked to the nationwide digital assessments that are forecasted to begin in 2014-2015." She notes a long list of obstacles and admits to being " optimistic that the train has left the station, that we already on the path to achieving this future. But [she is] also clear that we can barely lay the train tracks fast enough to keep up with the trajectory of the train."

Galina Meyer, an undergrad at Stanford, admits to being daunted by the short time horizon. "As an undergraduate, hearing that the education system is likely to shift in the next two years put a little impending deadline on my learning. Or rather, I really want to get involved in this movement, but (over)-confident estimates always seem to place that just out of reach, especially for those that come from an academic background. Listening to statements about this impending revolution always seems to keep the interested as remote observers."

An anonymous student offered a short contention to Tom's conclusions, arguing, "I most want to challenge Tom Vander Ark's contention that the influx of online will sweep into brick-and-mortar classrooms in such a short timeframe. I think we need to consider not only the existence of the technology, but also the impact on students. First, anything that affects the teacher-to-student delivery of knowledge requires students to adapt their learning, consciously or unconsciously, to optimize knowledge acquisition (or, if not optimize, bring it to an acceptable level). Second, digital interfaces may seem omnipresent in students' lives, but blended learning would add another dimension to students' interactions with technology."

Similarly, Jason Sellers was "...surprised by Tom Vander Ark's assumption that because states are moving towards online assessments, most students will be learning in blended learning environments by 2014-15. ... I am initially skeptical that it will affect education to the degree that Vander Ark suggests. If this were to happen, I don't think that most schools are equipped to scale that quickly." Tanner Vea used a Star Trek metaphor to mock Tom's claim that "We're months away from having the tools... to build peace and prosperity like nothing else we could work on."

Students seemed to appreciate Midgley's realism. Albert Lim said, "I guess what surprised me most was the confidence most of the panelists had on the rate of change that will hit us in the next 3 to 4 years, in the move from a predominant traditional mode of learning to one of pervasive blended learning. Perhaps Steve Midgley was more realistic, when he acknowledged that there are a lot more things that need to happen before we can fully realize the vision of digital curricula." Liam Aiello echoed many of his classmates concern about the pace of progress in education. "The pace of such change is much slower on the classroom level, a sentiment cleverly compared to the many time-zoned clocks that hang in hotel lobbies, as described by Larry Cuban on his blog (http://larrycuban.wordpress.com/2011/02/02/the-myth-of-failed-school-reform-part-1/). As Steve Midgley noted in his discussion of implementing any infrastructure, you have content, you have networks, and you have "devices." While these are

things that are often foisted upon a school or district from the outside, for such a reform to take place, the ability to weigh and measure the benefits of such drastic changes in the ways we collect and perceive data on students' learning should heavily favor the practitioners themselves."

Teacher and Student Reactions

From the student responses to the panel on K-12 Digital Technologies, one salient theme was an apprehension about how this would affect teachers and learners. Many posts questioned what this would mean for K-12 teachers in terms implementation and training. Similarly, responses questioned the ability for technology to actually help teachers teach better and student learn given the current infrastructure of K-12 education in this country and the failure of past reforms to penetrate the classroom walls.

Albert Lim questioned digital technologies ability to change instruction, "Teaching is a highly personal craft, and past reforms have shown that most reform efforts stop right outside the classroom door. Will digital curricula suffer the same fate? Sure, we may have exemplars of schools who can be trailblazers and role models in showing what is possible with going digital, but most schools may only see a glimpse of that possibility" (Albert Lim, Nov. 8, 2012). Johnny Winston shared Albert's apprehension specifically questioning the utility for teachers "I was surprised to hear the panelists talk almost exclusively about the structure and distribution of a new open curriculum, without mentioning how technology can be leveraged to actually help teachers create better educational resources." He specifically questioned the theory and assumptions behind Gooru. This was most apparent in Prasad Ram's comments about his company, Gooru, which serves as a search engine for learning. The theory behind Gooru presupposes that the most prominent problem with education is a lack of curation and search functionality. In other words, the best educational content is already on the web; however, it is hard to find, and it is not arranged in a way that is useful for the learner. This echoes the view of many of the panelists: that the educational infrastructure is broken" *(*Johnny Winston, Nov. 11, 2012).

Connected to other themes such as access to digital technology and equity in implementation and training and the speed at which the panelist saw these changes happening, several posts questioned if technology would only further serve to widen the divides in K-12 education rather than promote equity. As a former teacher, Molly was interested in the

implementation of these technologies and how they will promote equity for all students. In her post she stated, "Thus given the evidence that the last model for schooling stuck around for over a century, there is some pressure to replace it with a new coherent, flexible, future-reaching, equitable model. What does the process of education look like, sound like, smell like, feel like once our train has reached it's destination? And, what are the implications of this for those stakeholders who are members of the existing system over the next twenty years? To this conversation, I bring my experience as a teacher of underprivileged students in title 1 schools, committed to equity, justice, and truth for ALL students. (Molly Bullock Nov. 8, 2012)

Additionally, several posts brought up the notion of both teacher input and student voice in this revolution. In order to have the potential to be effective, several commentators felt that the planning and implementation must involve teacher and student perspective and voice.

Similarly, as a previous teacher in underperforming schools, Hallie Fox echoed Molly's sentiment about the difficulty in implementation relaying an example of poor implementation of a technology initiative. She stated, "I do not mean to be sarcastic, but I do think this approach vastly underestimates the role of the teacher in the front of the classroom. OLPC (one laptop per child) program was found to be relatively unsuccessful at empowering teachers and improving student learning. Their business model, designed by MIT engineers was simple: create, distribute, and then let's see what happens! So what happened? Teachers had minimal training, little technological support, and including laptops in the classroom seriously threatened their pedagogical approach to teaching. The OLPC engineers hoped that by providing the technology, teachers would adapt to use it. That did not happen. Incredibly mixed results have been found and most teachers complained about feeling forced to use laptops without understanding how or why. We need to consider examples like these before we consider system-wide reform "(Hallie Fox, Nov. 8, 2012).

Albert Lim responded to Hallie's post and further deepened the argument by sharing an anecdote about his time working in schools in Singapore and the challenges that were faced in implementation. "In the school I was working in Singapore, we tried to rebalance the curriculum over the last couple of years by shifting the emphasis towards the development of skills, in addition to academic outcomes. Technology was one of the things we leveraged on, as it can facilitate greater student self-directedness, and allow collaboration within and outside classrooms. For example, we tried the use of student forums to allow students a space for

discussions which can extend beyond the classroom, student projects took the form of podcasts and vodcasts, e-learning days where students spent a day learning at home, etc. This required teachers to develop new teaching strategies, and the school schedule was adjusted to allow teachers time to experiment with technology-enhanced lessons, as well as time for professional development. It was interesting that while most teachers agreed that skills development was important, a large number of them remain entrenched in the same way of teaching in their classrooms for various reasons, including not having the confidence to move away from a form of teaching that "works", feeling the pressure of keeping achievement scores up, not having enough time to plan for lessons, etc. There were some small successes, but it was a lot of hard work (Albert Lim, Nov. 8, 2012).

Finally, Max Alexander brought student voice into the conversation questioning where students fit into all this. In his post he stated, "One element of the panel that I felt wasn't sufficiently addressed was the role of students in an educational enterprise model. With the exception of Catherine Casserly's discussion of the ability for students to use Creative Commons to license and share their work, much of the conversation seemed to define educational consumers as parents, teachers, and school districts. While these are certainly the people who are pulling the $ strings, this discussion overlooks an important element that plagues education. While this is a topic much larger than a blog post reaction- one of the major obstacles to educational reform is simply the fact that in the United States, and most part of the world, compulsory education implicitly creates a "culture of conscription" at schools. If we are to treat teachers, parents, and districts as consumers with choice in regards to the best learning options available to them, why are we not talking about students as consumers as well? Perhaps this was Vander Ark's implication when he referred to students have their own customized learning playlists, but at the end of the day, is the question really about what defining the "tracks" that will maximize the student's learning efficiency, or about allowing them to choose the "service" that best fits with their learning interest and personal identity (Max Alexander, Nov. 8, 2012).

New Mediums for Learning

Another common theme between posts was questioning whether current education mediums (PowerPoint, video lectures, pages of text, etc) should be improved. Clinging to old habits in a new medium is a natural occurrence after new technology is created—more complex innovations mimic the familiar past. The printing press had fonts imitating the stylized

handwriting; now we have online schools giving lectures and multiple-choice questions. Outdated mediums seem silly in our new, infinite virtual world. As Johnny Winston said, "technology can be leveraged to actually help teachers create better educational resources … Yet, another question is being continually overlooked: "What about the educational vehicles?" How can we improve upon the current vehicles for education (PowerPoint presentations, pdf documents, e-textbooks, forums, multiple choice quizzes, whiteboard video lectures, YouTube videos, etc.) that are being used to teach online and in the classroom. Is the problem really just about curating and delivering these current educational vehicles or is it about innovating and creating new ways to use technology to package and teach educational content?" One good example to back up this argument is the slowly changing face of online programming sites. Now, such sites automatically (in real time!) compile the code, so changes are immediate and the relationships between variables are clearer. This is only possible on a computer, so why not expand and find more intuitive ways of interacting with a screen.

The same writer then continued: "Technology makes a failed model scalable and more effective—but it's still a failed model... Open access to antiquated teaching materials is better than a closed learning environment, but if the teaching materials employ the same educational tools of the 20th century, then you can hardly call that a true innovation in education. Education needs new vehicles and infrastructure to transition into the 21st century. Currently I think there is an overfocus on the infrastructure, while the potential for new vehicles is being overlooked." Not only is the current system bad, but the online system can be continuously improving and return to affect how public schools are taught. The overfocus on how to scale these models to the scale of billions of users has technological and some social impact, but this leads to ignoring more central issues.

More broadly, Dan Meyer agrees: "This 'open education resource set'—at least in math education—seems balanced heavily towards video lectures and exercise sets. These are aspects of a math education that very few people recall fondly." This seems to be particularly directed towards Coursera, so while Coursera is not very different than most of these, it seems to be more focused on recreating a previous model instead of recreating one. This brings up all the negative trends in physical schools, from lack of connection with students to teachers that cannot phrase their explanation well.

Another blogger, Jason Sellers "was surprised when Prasad Ram compared the way that we envision the future of education to thinking about movies as merely performing a play in front of a camera. I wonder how I've been inhibited in thinking about the future of education due to biases resulting from my own experience in "traditional" education." This quote solidifies this large theme, questioning the basis of all real communication on whether they are socially constructed or not. Perhaps through more online innovation, more about the human mind can be unraveled, however, ridding the biases of our mind would destroy all our culture, so there will probably be limited success in that field.

Conclusion

The panel raised many discussions around important considerations in digital learning. While there seems to be disagreement on issues such as content creation and ownership, access, timing, teacher and student reception, and feasibility, most people agree that digital education will impact the landscape of education in the future in some way. The panelists were largely bullish on digital education, but there seemed to be more skepticism from the established academic community about whether that impact will positively or negatively affect students and learning. The wide acceptance and adoption of digital learning will likely require the buy-in of all constituents in the education space. It will be interesting to see whether alignment of interests can occur and how this sector will progress in the future.