

Evolution of Digital Curriculum

Risks, Opportunities, and Innovations of Evolving Digital Curriculum

Molly Bullock, Greg Bybee, Hallie Fox, Meaghan Stern

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Part I: Risks of the digitization of these public-contribution activities

While generally optimistic, EDFers raised concerns about some of these new digitized innovations. These concerns were primarily in regards to information overload and granularity, permanence, privacy, pedagogy, and equity.

Information Overload and Granularity

There was much concern about information overload. Katie Hagey commented: “One concern I have about the digitization of public-contribution activities is that it may contribute to the vast amount of information available in the digital sphere, without increasing the amount of useful information. In Nate Silver's language, I imagine we might see the 'noise' compounding relative to the 'signal', thereby rendering it more difficult to find truth and interpret. I doubt that this concern is so grave that it may debilitate public-contribution activities, but worth considering that forums involving public contribution will need to deal with generation of not useful, misleading, or downright wrong content” (Katie Hagey, EDF Post Week 6).

Manmeet Manvi similarly addressed concern about the danger of controlling the quality of information available to students online. “The biggest risk of digitization of public contribution is the distributed responsibility with little control on the quality and the integrity (correctness) of the data. The public contributor may not be qualified to provide accurate and complete information” (Manmeet Manvi, EDF Post Week 6). Tyler McNally described this risk as one of granularity: “Since storage and transmission costs are so cheap and tending towards zero, there is no reason to be selective in what aspects of information is kept and what is not. We keep everything and everything about everything. Word and wikipedia store every word types, deleted, and retyped; logs the location and time when these events occurred and identifies who did what. The end result is no longer just the story; the stream, enabled by digitization, becomes the story” (Tyler McNally, EDF Post, Week 6).

Privacy and Protection

Another inherent risk EDFers raised was about student privacy and protection. Max Alexander and Liam Aiello, both former teachers, addressed the risk of student information being available publicly online. Max commented, “As it stands, schools tend to default towards restricting any student information or production from appearing on the web- but is this really an appropriate way of training students to represent themselves on the internet? I do believe that there is a balance to be struck between protecting students personal and private information and allowing them to share information about themselves and their work with a broader audience” (Max Alexander, EDF Week 6). Liam used wikis in his 5th grade humanities curriculum, aware it was

a risky endeavor. “Then parents would hear about my use of wikis in my humanities curriculum, the most commonly voiced concern was in line with what Matt Williams shared: you’re sharing my child’s writing with the world? Is that...okay? I would assure them that I was able to maintain a great deal of control over what was shared publicly, and how students responded to one another’s writing...I would often promise parents that, towards the end of the year, I would open access to the site to them, so they could see the results of students’ progress as online collaborators and creators. And yet, come the end of the year, I never once did share open access to the site with the parents. I would hedge, concerned that they would “gather data” on their own child, and one another’s children, and on me as a teacher that they were free to interpret in whatever way they saw fit. So too, then, would my concern grow should my students’ work be suddenly shared with the entire online world. While I would hope that the power behind this public sharing might be something I could get students to uptake, I would also be concerned at which age felt appropriate for such a monumental exposure to the informal (or, perhaps, formal, should any data analyst choose to be interested in 5th grader’s writing topic choices? Who knows?) evaluation of many more eyes...But certainly, Matt’s concerns about what information, and judgments, might be made when we share students work publicly for the sake of introducing them to the responsibilities and risks of online publication” (Liam Aiello, EDF Post Week 6).

Tyler McNally agreed there are legitimate concerns about privacy. “Digitization makes search and access easier. Its possible (though not feasible) that someone could visit local public schools around the country, taking notes on what students are reading, writing and creating. Not everything would be accessible, but one could acquire a lot by reading school newspapers, looking at physical message boards, and simply asking students "would you be willing to give me a paper copy of your essay?" Digitization transforms this process from an infinite (and therefore, likely useless) endeavor to one that is instantaneous” (Tyler McNally, EDF Post, Week 6).

Limited Risk Taking?

Others worried the digitization of educational activities may actually inhibit students’ risk taking. “For instance, if every remark we made in EDF was posted, searchable, and tied to our names in written form, some of us might be more reticent to speak or to offer daring ideas. The notion of the classroom as a "safe space" applies to taking risks in written projects as well. There are any number of papers written by my 60 very bright Stanford undergraduates which include remarks that, in context, are simply not fully thought out — and out of context would quickly become problematic. Instructors can edit their students' work before making it available for public consumption, but this solution would detract from the ownership students feel about the contribution.”

Permanence

There is also the issue of permanence. Anita referenced Viktor Mayer-Schönberger, who argues in "Delete: The Virtue of Forgetting in the Digital Age" (2011), “it is becoming virtually impossible to delete a digital record. Students need to take risks in the classroom, to be uninhibited enough to make mistakes (within reason), and to have the safety net of knowing that their thoughts —

however premature or minimally developed — will not necessarily follow them into adulthood. Certainly, some projects are simply innocuous. I don't think there's any deep ethical problem with the astronomy project, for instance. But when student work becomes (massively) public, a new host of concerns arise related to the lasting nature of online material. The phrase "never sign your name to something you aren't proud of" takes on a new magnitude when projects from elementary school onwards could be retrievable by interested parties (potential employers, for one) later in life" (Anita Varma, EDF Post Week 6).

Tyler McNally also expressed concerns over persistence online. "There is no delete button on the internet. Great in some respects for information preservation, but as discussed during class, there is something to be said for a world in which what you did, said, or wrote when you were 15 years old is a vague, distant memory for just a small group of people rather than an instantly called-up data point online. Digitization is immortality, with all the beauty and terror that goes along with it" (Tyler McNally, EDF Post, Week 6). This also brings to question traditional academic citation. As it stands, it is not "equipped to deal with modern scholarship, especially as it becomes more multi-modal" ([Paul Franz @Paul_Franz](#)).

McNally summed up our concerns about digital contribution in classrooms well: "Taken together, these effects create a new kind of information space that can be a dream for researchers in the aggregate — we are collecting almost comprehensive data, down to the bit, of the what, who, where, when and how — all the better to understand the why. But this kind of detailed aggregation becomes anxiety-provoking at the individual level. It's fun when you can keep tabs on your friends by going to their Facebook profile and seeing their wall. It's a different experience when you can search every friend profile instantly and find out who recently became single, lives in Boston and likes to go to [insert name of bar here] on the weekends. It's not often we (humans, society) have to consider the idea that just because we can do something doesn't mean we should. In a world of scarcity, things that help us be better, faster, cheaper are presumed to be good. But information technology makes scarcity obsolete. Without scarcity forcing choices, an informed public working through institutions and leaders have to make these choices. And perhaps the types of public contribution activities that were presented in class are just the right kind of activities that are needed to educate the next generation via direct experience about the risks and opportunities of digitization. We might not appreciate how sweeping the impacts of digital search, access, granularity and persistence are until we see our own digital cave drawings immortalized. Once its digitized, there is no delete button, but after experiencing that, perhaps we can make informed choices about what to digitize and when" (Tyler McNally, EDF Post Week 6).

Pedagogy

In response to conversations started during class Week 7, Paul Franz called for better instruction while tweeting: "you can't just give kids the game/book. You also have to get them to play/read like a designer/writer" ([Paul Franz @Paul_Franz](#)). Paulo raised another concern about STEM in classrooms and digitized learning: "At the moment, teachers are feeling left out of the Maker Faire, Maker Movement. Kids are having all the fun" ([@PauloBlikstein](#)). He reminded us "hands-on learning is an old idea, but every 20 years we have to remind ourselves

about it”; plus, “hands-on learning is expensive” (@PauloBlikstein). The rush to flip these process is “wrong. We should start with hands-on and then teach the material” (@PauloBlikstein). These concerns reflect the risk of rushing ahead with technology without considering the relevance of pedagogy.

Others also voiced concern about replacing human skill and ability. Meaghan Stern brought up the example of “super-suits” in recent Olympic swimming competitions. “Super-suits brought up many questions regarding the relationship between technology and ability: did technology render talent/ability unnecessary? What happened to the swimmers who did not have access to suits? If they had the suits, would they be able to compete for the top spots, or were they actually slower? Did swimmers with the suits really earn their place on the medal podium or in the record books? Does it actually matter that some swimmers set records with suits? Isn’t that just the next frontier?” If we use technology to replace talent, then we may miss the opportunity to teach “hands-on” skills and knowledge like that expressed by Paulo, Zuckerberg, or Gates. Teachers may “become superfluous as a result of technology.” How can teachers be a part of this revolution?

Equity

Meaghan compared the super-suit controversy to technology in the classroom and also raised questions of equity: “Will students with access to technology begin to learn new and different ways that will benefit them more than students without new technology? Is technology another way to separate “haves” from “have-nots”? Technology in education is frequently seen as an equalizer — a way to bring education to parts of the world or society that does not have access (remote locations in India that benefit from web-based medical collaboration, for example), or a way to differentiate instruction to reach all students at the appropriate math levels. However, I still am somewhat skeptical about what happens if everything becomes technology based, and there are still people out there without access. What happens to the argument about equity then? The swimming world responded by outlawing the technology and putting asterisks next to records set while swimmers wore suits. If technology ends up creating inequity, what do we do next?” (Meaghan Stern EDF Post Week 6).

Part II: Opportunities for the digitization of public-contribution activities

When challenged to think about the implications of digitization for curriculum and pedagogy, EDFers were hopeful about the promises of technology to transform STEM, humanities, and K-12 learning. Digitization has the power to disrupt the current state of education and the status quo, providing opportunities for more and deeper access to knowledge, and participation in knowledge creation.

Disruption

Manmeet Mavi brought up the digitization of textbooks and their potential to disrupt the publishing status quo. He described the work of CK-12, which has “created an open-content, web-based collaborative repository of books termed as the “FlexBook.” “Flexbook is an “open platform [which] allows public/teachers to add and modify the content... Through digitization of

public content, Flexbook has the potential to disrupt the K12 book publishing industry which relies on copyright and royalty to maintain ridiculously high book prices. CK12 might render the K12 book publishing industry obsolete in the same way as Wikipedia made encyclopedias such as Britannica obsolete.” (Manmeet Mavi, EDF Post Week 6)

Meaghan Stern echoed technology’s potential to disrupt the status quo: “Technology in education is frequently seen as an equalizer- a way to bring education to parts of the world or society that does not have access (remote locations in India that benefit from web-based medical collaboration, for example), or a way to differentiate instruction to reach all students at the appropriate math levels.” (Meaghan Stern, EDF Post Week 6)

Tyler McNally wrote about the promise of trending toward democratization through digitization since “digitization makes search and access easier.” The opportunity to be able to trace the arc of information and its development adds richness and depth to the story. Technology also renders school learning more consequential. Students described the opportunity to “for schoolwork to make a meaningful contribution to global communities,” as Anita Varma posted. (Anita Varma, EDF Post Week 6)

Student Exploration and Discovery

Hallie Fox touted the opportunity for engagement and discovery when students use technology to become the drivers of their learning. “With the use of technology, we can actually let students explore and discover. They can take action in their communities and their world. Students want to do this. As a teacher each spring I did a project on endangered species with my 5th graders. There was nothing more exciting for me then to see my kids search for answers to their own questions and develop solutions to problems they cared about. I could not do that with our science textbook and the supply of books was so limited at my school that technology was not only more efficient, but also connected directly to student-led discovery.” (Hallie Fox, EDF Post Week 6)

Hannah Miller Rich discussed the authentic value of online learning experiences. Students develop “tangible skill through exploration.” She also noted practical applications of online learning: “The ability to contribute to, and not just consume, online material is a powerful tool for the social and private sector. The experience interacting with social and public media may also prepare students to be able to market themselves or publicize their business ventures later in life. Using the internet as a venue for publicity is a skill that cannot be undervalued.” (Hanna Miller Rich, EDF Post Week 6)

In Week 7, EDFers dove into describing specific ways classrooms, textbooks, and students might possibly benefit from digitization. Opportunities for transforming teaching and learning ranged from digitized and linked texts, support for special education, bridging school and real-world applications, and visualization.

Transform Classroom Teaching

Current and former teachers noted the opportunities technology affords their classrooms. Liam Aiello expressed the value technology adds to student voices, removing the teacher from a position of “prime knower’ of a text, shifting this role to his or her students as much as possible.” (Liam Aiello EDF Post Week 7) Matt Williams likewise discussed using a wiki achieve that objective, posting text and engaging students through online commentary for high school literature circles. Digitization of texts also circumvents the challenge of acquiring sufficient physical texts for students. “What emerged was a live text, full of close readings and interpretive discussions. The students loved it (they met my goals too) and we even ended up printing it out in the end of the unit and binding a copy for the next year’s class” (Matt Williams EDF Post Week 7). Max Alexander and Meaghan Stern engaged in a lively conversation about the benefits of restructuring a digital history textbook with live links to other sources and topics, thus expanding the field of knowledge that students would be able to consider “history.”

Support for Special Education

Hallie Fox noted existing technological supports for Special Education students, “For students who were truly dysgraphic, I used adaptive technology so they could record their writing before a scribe would write it down (often myself or a parent)” (Hallie Fox EDF Post Week 7). She also acknowledged ways that technology might help engage struggling writers: “It was also challenging to teach and manage because students were always moving at a different pace through the writing process. Some took days to brainstorm and outline while others rushed but needed more time editing and revising their work. If there were an online tool to help students through the process and help them focus on their ideas rather than the details of spelling, I think many of my students with IEPs would have been far more confident and excited about writing than they currently are. An online tool could provide students with examples of the type of writing they are doing, a recording device to verbalize ideas and listen to them later, sentence starters, or outlines to help them plan their work. For students with disabilities, using graphic organizers and having aids (like dictionaries or word lists to help spell) can drastically reduce anxiety about writing and enhance their performance. For example, if students are working on a persuasive writing piece, they would be able to reference examples of other student work (that is about at their level), brainstorm ideas, draw ideas, use an adaptable outline, sentence starters, and spelling help. Making this interactive and allowing space for teachers to comment on a student’s work or letting peer editing occur (I am thinking about leaving comments as you may do on PDFs) would be a fun, easy way to engage students in the writing process.” (Hallie Fox EDF Post Week 7)

Bridge School World and Real World

Molly Bullock noted that technology has an opportunity to bridge the world of school with the real (social) world where students are already “content producers” via YouTube, Twitter, Facebook, and blogs. She also suggested the promise of “longitudinal digital portfolios” that allow “parents, teachers, and students to see growth and change over time” and may be “tracked, aggregated, and summarized in a dashboard optimized to illustrate growth over time.” Thus, rather than at an end point, achievement evaluation might “take place over multiple points during the year and students should iterate on an upgrade to their publications throughout the

year” (Molly Bullock EDF Post Week 7). Digitization offers the chance to restructure how we think of traditional teaching and learning tools of textbooks and assessments.

Visualization

Anita Varma described opportunities to create visuals to accompany students’ and teachers’ flexible thinking. “[A schematic’s] arrows, connectors, and interactants could all be moved by the instructor and by the student to 1) reflect how a different study might conceptualize the same concept/model and 2) to indicate the fluidity of how communication unfolds as dynamic rather than stagnant” (Anita Varma, EDF Post Week 7). Michael McLaughlin visualized a world wherein “any equation in a [Chemistry] textbook could be clicked on to bring up a series of videos that run concurrently. One video would show the reaction as actually performed with large scale chemical samples. Another video would show a molecular model view of the process.... This would retrain the student brain to think in parallel about what is happening in the macro- and micro-scale worlds” (Michael McLaughlin, EDF post week 7). Restructuring students’ interactions with curriculum can promise to change the way they think and the way they see the world.

Part III: Innovations

Throughout the posts, students considered existing and potential innovations enabled by digital curriculum. Broadly, these fell into four buckets:

- 1 Improving pedagogy through digital curriculum
- 2 Visualizing and interacting with content
- 3 Improved content discovery and richness
- 4 Broadened access and openness

1. Improving pedagogy through digital curriculum

Several students commented on the potential for online or digital content to improve pedagogy.

Liam Aiello writes about changing the way we think about “reading comprehension” by allowing students to create their own knowledge around a piece of literature and engage in rich discussions. In essence, Liam proposes moving away from the traditional textbook model of understanding literature and instead, “offer [students] a space, with digital access to a text, ways to manipulate it and select passages/images for citing evidence (or for remixing, should that better offer a student a chance to express his or her interpretive stance), and ways of recording written responses that can be revisited and reflected upon by the students who wrote them.”

Paul Franz, Greg Bybee, and Robert Lucas discussed on Twitter whether MOOCs were good for pedagogy. Although they disagreed slightly, all seemed to agree that existing MOOCs do not offer greatly improved pedagogy, though some, like Venture Lab, have great potential. In particular, they point to the potential for more individualized, student-centered adaptive-learning. Moreover, significant amounts of data can be used to better understand how students learn.

Manmeet Mavi also pointed to the fact that digital content, including even online textbooks, have the potential for adaptive learning.

2. Visualizing and interacting with content

Digital curriculum is not just another way to access existing content, it allows content to be “restructured” or visualized in dramatically new ways.

Hallie Fox shared her experience using Mimio, which “use[s] interactive white boards, iPads, and online programs to help advance student learning. Their products are designed for literacy instruction but involve teacher-directed instruction, formative assessments, collaborative learning, and adaptive instruments to support reading growth.” She continues to explain how technologies like this have helped her teach 5th and 6th grade special education, and the potential for further innovation. She suggest, “An online tool could provide students with examples of the type of writing they are doing, a recording device to verbalize ideas and listen to them later, sentence starters, or outlines to help them plan their work. For students with disabilities, using graphic organizers and having aids (like dictionaries or word lists to help spell) can drastically reduce anxiety about writing and enhance their performance.”

Anita Varma proposes a “digital restructuration that would [offer] ...the ability to draw an interaction schematic, but for the schematic to have movable parts. She offers a number of potential implementations, including “a SmartBoard which the instructor can draw on, and a networked way for students to draw on their own screens but have it appear on the class-wide board. This way, an instructor could 'call on' a student in a digital setting and have the student's re-modeling appear for everyone.”

Michael McLaughlin offers a similar innovation for visualizing chemical reactions. He suggests, “Ideally any equation in a textbook could be clicked on to bring up a series of videos that run concurrently. One video would show the reaction as actually performed with large scale chemical samples. Another video would show a molecular model view of the process. Finally additional videos could run that follow the energy or entropy changes in each chemical species.”

3. Improved content discovery and richness

Clearly, digital content online makes the content far more discoverable and easily edited. Several students focused on how the Wikipedia world is hitting education and will transform the way teachers and students discover and consume information.

Manmeet Mavi posted on “FlexBook disrupting the K12 book industry.” Described as an “open-content, web-based collaborative repository of books,” Manmeet supposes that FlexBooks could make all textbooks free and disrupt the K12 publishing industry in “the same way as Wikipedia made encyclopedias such as Britannica obsolete.”

Meaghan Stern makes a similar point, but goes further to suggest that “online texts with embedded links” would enable “myriad of possible connections” between content. In fact, she

offers a number of ways in which online or digital textbooks might transform learning. “The digital version would be adaptive to student reading levels: it would allow students to read the same “text” but easier words would be substituted, more images inserted to help students decode the meanings of challenging paragraphs,” she explains. “The digital book would also be linked to different sites that provide more information about a particular vocabulary concept, word, person, place, or event.”

Hallie Fox points out that digital content revives “Dewey-ism” and enables students to easily “explore and discover” new content. Tyler McNally concurs. “Digitization makes search and access easier. Its possible (though not feasible) that someone could visit local public schools around the country, taking notes on what students are reading, writing and creating. Not everything would be accessible, but one could acquire a lot by reading school newspapers, looking at physical message boards, and simply asking students “would you be willing to give me a paper copy of your essay?” Digitization transforms this process from an infinite (and therefore, likely useless) endeavor to one that is instantaneous.”

4. Broadened access and openness

On a related point, digital content, particular when online, enables a new level of openness and accessibility.

As Tyler noted (above), “Digitization makes search and access easier.” Several students talked about how this access, particularly Massively Open Online Courses (MOOCs) are transforming student learning. In the twitter discussion, Paul Franz, Greg Bybee, and Robert Lucas debated how open MOOCs really are. Greg argued that MOOCs really are open — at least as much as is realistic today — and that openness and pedagogy should not be confused.

Many students discussed the risks of the publicity and permanence of student-created content online. While the risks were discussed earlier, it’s important to note that this permanence itself, is a great innovation — in hundreds of years, primary research will be completely transformed, and no one will ever have to wonder what an original author really said.

Conclusions

Though digital curricula offer numerous possibilities to transform classrooms, they must be pursued with a bit of skepticism. While technology offers the chance to innovate and enhance student’s educational experiences, it cannot replace the intangible connection between a teacher and a student. We must be cognizant of the fact that “one man’s risk is another’s opportunity” and one man’s opportunity may be another’s innovation. To sum up our thoughts, Molly Bullock created an ingenious infographic highlighting the tension between risk, opportunity, and innovation in digital curricula.



Education's Digital Future Discusses:

Learning in a Digital World...

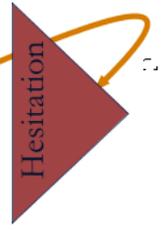
Increased Access to Specialized Knowledge
Visualizations and models make accessible what was once invisible. Get the type of information you need in the format best for you. You too can master Statistical Molecular Thermodynamics.

Democratization of Resources
Instantly answer any question your science book never answered. Circumvent the challenge of finding a class set of physical texts. Free up time to worry about having a class set of devices. Uneven access could mean a dangerous digital divide.

Changing Skillsets, Changing Pedagogies
Teacher Decentralization: from sage on the stage to guide on the side. Students master basic skills through individualized instruction. Use of the internet as a tool for publicity is a valuable skill. How will teachers get training, infrastructure & support? Kids must learn the risks and responsibilities of online publication.

Information Overload
Is there too much noise to find the signal?

Credibility
Kids & adults still lack skills for evaluating source credibility.



Contributing to the Digital Landscape....

Near Infinite Storage, \$\$ Approaching Zero
Ever think about printing the contents of your computer? Does the fact that we CAN record everything mean that we SHOULD?

No Data Point Left Behind
Tracing the arc of information gives depth & richness to how we know. Granularity- we are keeping everything about everything.

Child Development
Models & sims allows productive failure & decreased consequences. What is the right age for a wide public audience?

Distributed Content Creation
Student agency grows with contributions to local & global community. Are all perspectives equitably represented?

Decreased Barriers to Publishing
Disruption? Will Pearson go the way of Encyclopedia Britannica? Google returns 86 million results for lesson plans, where do I start?

Sharing without Boundaries (Informal)
How many Harlem Shake videos is too many Harlem Shake videos? If you haven't uploaded it, does it really exist?

Digital Immortality
ANXIETY- once you press send, the words are yours for eternity. There is no delete key on the internet.



Digital Curriculum

Using Learning Data...
Detailed Data Aggregation
Longitudinal portfolios instead of yearly multiple choice tests. Does data reflect what it claims to measure?

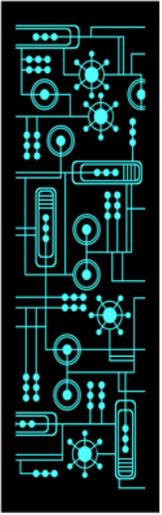
Authentic Inferences
Data needs a huge amount of cleaning. Quantity is only good if there is also quality. To really understand the data, you must also know the CONTEXT.

Instantaneous Data Collection
Does the threat of permanence raise our barriers to participation?

Privacy vs. Access
Is there control over who accesses student data? How, when, why?

Data on Minors
Is enough being done to protect the rights of children?

Easy Searching
Aren't adolescent mistakes are best forgotten?



One person's risk is another person's opportunity.

One person's opportunity will be someone's innovation.